# ELECTRICAL TIMES

## FERRANTI

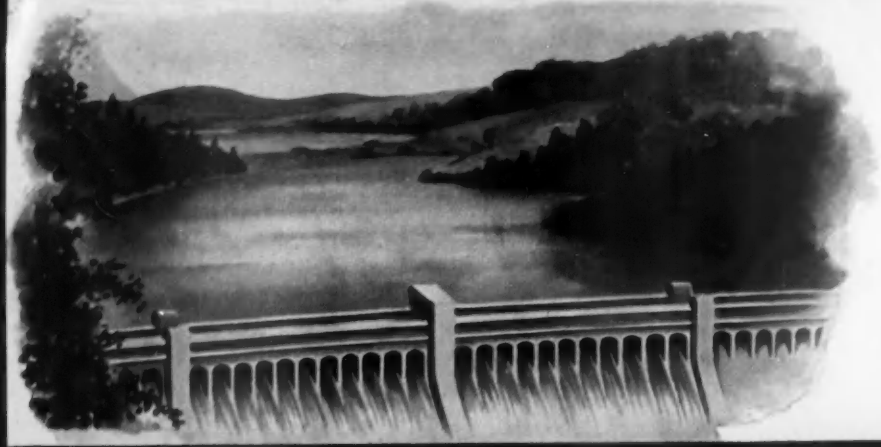
### SWITCHBOARD INSTRUMENTS

F
FERRANTI

*List IN30 and other catalogues supplied on request.*

Illustrated above are several Ferranti Switchboard Instruments from a wide range. Shallow pressed steel cases 3¼", 3½", 4", 6" and 8" round or square dial. Projecting or flush mounting. All types of Ferranti switchboard instruments are also available in hermetically sealed cases.

**FERRANTI LTD · MOSTON · MANCHESTER 10**
Head Office and Works: HOLLINWOOD · LANCS
London Office: KERN HOUSE, 36 KINGSWAY, W.C.2



# Supplying the needs of the Electrical Industry ✻

# COOPERS FELT

Felt Polishing Bobs

Felt for machinery installation

Felt washers, gaskets, strips, channels, rings

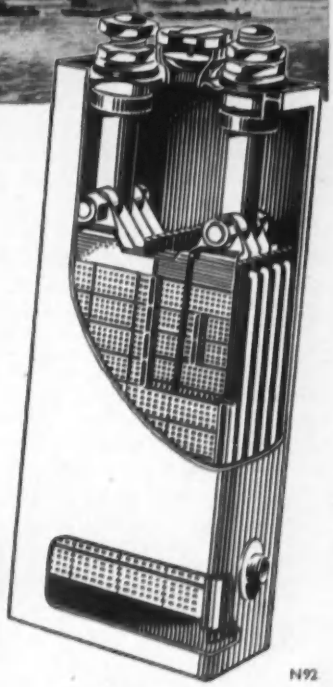
Felt soft as cotton wool or hard as wood

Coopers Felt serves the industry in many ways

Coopers will be happy to send you free literature

**COOPER & CO. (B'ham) LTD., BRYNMAWR, BRECONSHIRE.** **Tel: Brynmawr 312**

# Which battery is built like the Forth Bridge?



**Nife is its name** — it's also made of steel. For like the Forth Bridge a Nife Battery is built to last—to withstand shock and vibration and to stand up to severe mechanical conditions. But here the similarity ends, for a Nife Battery is light and compact, takes up very little room and only requires the minimum of maintenance. Further, a Nife withstands the heaviest discharge, is free from self-discharge and is unaffected by idleness in any state of charge. *It repays its original cost many times over!*

**These are the reasons why so many Electrical Engineers rely on Nife Batteries for:**

SWITCH CLOSING · SWITCH TRIPPING · EMERGENCY LIGHTING
STANDBY POWER FOR AUXILIARIES AND CONTROL CIRCUITS
SEARCHLIGHT AND INSPECTION SETS · DIESEL ENGINE STARTING
PORTABLE SAFETY LAMPS · TELECOMMUNICATIONS
BATTERY ELECTRIC TRUCKS AND LOCOS

# Its name is NIFE

THE **STEEL** ALKALINE BATTERY

N92

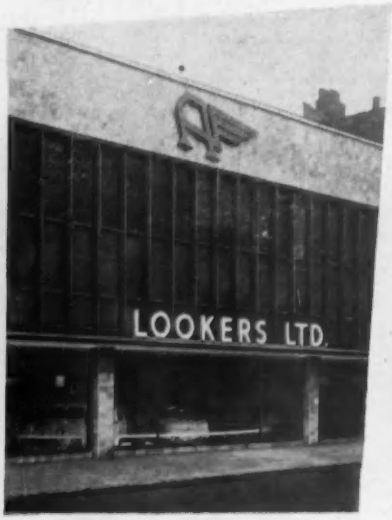
*Nife Batteries · Redditch · Worcestershire*

A

# "Panelec" CUTS HEATING COSTS

**Panelec Embedded Electric Low Temperature Radiant Floor Warming guarantees an atmosphere of comfort and warmth in any type of building, whatever the outside temperature — at a cost which is always comparable with, and often less than any available alternative form of heating.**

*Schools: Hilton Primary School, Newcastle-on-Tyne*




*Showrooms: Lookers Ltd. Deansgate, Manchester*

*Hospitals: Operating Theatre, Glasgow Royal Infirmary*

**ARCHITECTS!** *Panelec Low Temperature Radiant Warming System reduces building costs. It requires no boiler room, saves fuel storage space and eliminates pipework and radiators — simplifies the job of design too.*

**ELECTRICAL CONTRACTORS!** *You can install Panelec quickly and easily. It is foolproof in operation, thermostatically controlled and requires no adjustment or maintenance.*

**USERS!** *With low initial cost and low operating cost*, Panelec is fully automatic, totally concealed, causes no discolouration of furnishings or decorations, is silent and completely safe.*

Panelec can be installed in old or new buildings. Embedded in the floor it is clean, safe, healthy and automatic . . . ideal for use in Schools, Hospitals, Factories, Hotels, Flats, Public Buildings and Homes etc.

The Panelec Technical Advisory Service Engineers are always available to discuss your heating problems and advise you on the best application of this system. Further information is contained in Publication No. PAN.655 D available on request.

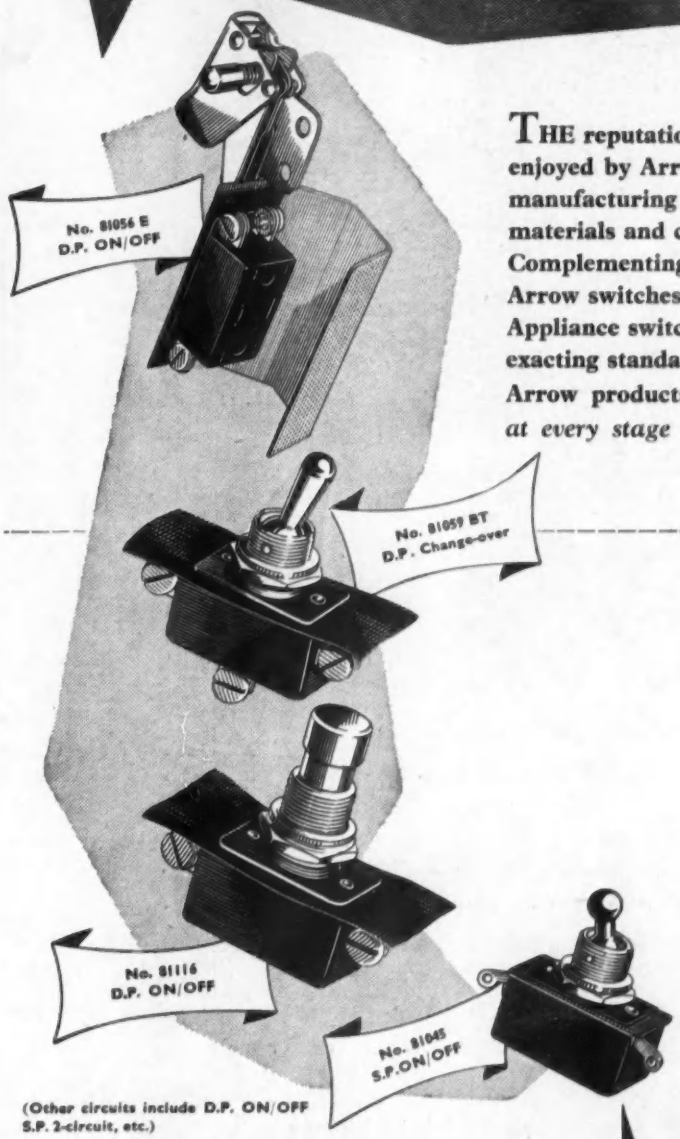
REGISTERED "Panelec" TRADE MARK

* Panelec is designed to take advantage of OFF-PEAK tariffs.

**N.B.** "PANELEC" is the original, registered Trade Name for this patented Warming System, which can only be obtained from the address shown here.

PANELEC (GREAT BRITAIN) LTD.
27 HATCHLANDS RD., REDHILL, SURREY
Telephone: REDHILL 3461 (5 lines) P.B.X. Telegrams: MURELEC, REDHILL

# AN ENTIRELY NEW RANGE OF "INTERMEDIATE" INSTRUMENT AND APPLIANCE SWITCHES




(Other circuits include D.P. ON/OFF S.P. 2-circuit, etc.)

**THE reputation for reliability and efficiency enjoyed by Arrow products stems from a realistic manufacturing policy supported by first-quality materials and craftsmanship.**
**Complementing the already extensive range of Arrow switches, these new Instrument and Appliance switches are manufactured to the same exacting standards — and like all Arrow products are *individually inspected at every stage of production.***

These switches are all available with solder lugs and binding screw terminals and either type of lever illustrated. They have quick make-and-break mechanisms and carry 3 amp. 250 volt ratings.

Their main characteristic is the maintenance of low contact resistance after considerable life, and are therefore ideal for instrument and electronic work.

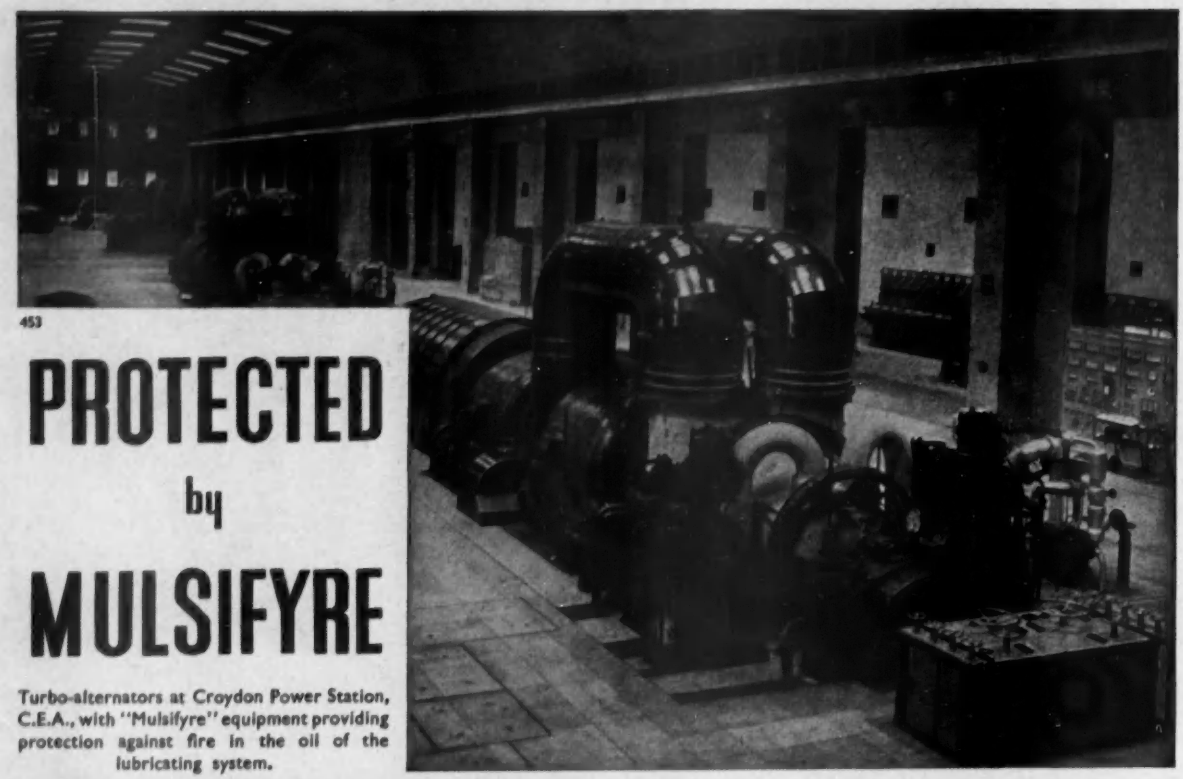
The same switches, when fitted with either spring-loaded trigger levers or double-acting mechanisms, are particularly suitable for portable tools or foot-operated appliances when enclosed switches are preferred and approval in export markets a necessity.

*SEND TODAY FOR FULL DETAILS*

**ARROW**

**ARROW ELECTRIC SWITCHES LTD · HANGER LANE · LONDON · W.5**

AR.14



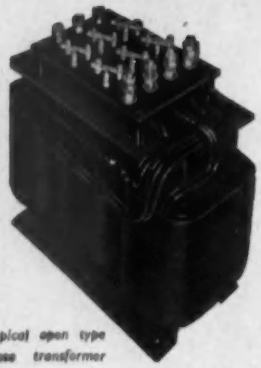
453

# PROTECTED by MULSIFYRE

Turbo-alternators at Croydon Power Station, C.E.A., with "Mulsifyre" equipment providing protection against fire in the oil of the lubricating system.

**MATHER & PLATT LIMITED** PARK WORKS · MANCHESTER 10 PARK HOUSE · 22 GT. SMITH ST · LONDON SW1

# HEAYBERD TRANSFORMERS



*A typical open type 3-phase transformer*

*A Model 402 Auto transformer, 200-250 volts to 100-110 volts, 50 VA*

## From 8VA to 100kVA

HEAYBERD Transformers are designed to give the utmost reliability and economy in operation, fully in accordance with the revelant British Standard Specifications.

We shall be pleased to quote for open and enclosed type transformers to suit your particular purpose.

Write for List 1054.
Also C.S.A. approved Transformers.

HEAYBERD

**F. C. HEAYBERD & CO. LTD**

Head Office: GREENWICH SOUTH STREET, S.E.10. Phone: TIDeway 4646 (3 lines)
Works: Greenwich. Cables & Telegrams: "Heayberd, Green, London"

# Power on the spot

## CABLES FOR ALL PURPOSES IN MINES AND QUARRIES

# MERSEY

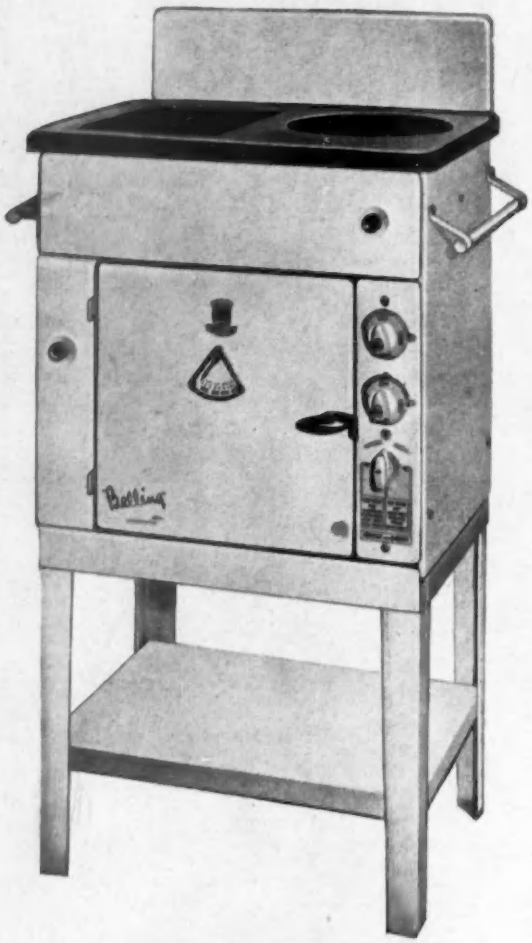
## FOR SAFE CONDUCT ALL THE WAY

**MERSEY CABLE WORKS LIMITED**
**LINACRE LANE · BOOTLE · LIVERPOOL, 20**

A TI COMPANY

*Telephone: BOOTLE 4111 (4 lines)*
*Telegrams: "MERCABLES, LIVERPOOL 20"*

# BIG BABY "BELLING" sales ahead




There will certainly be very big Big Baby Belling sales ahead. Production on our new assembly lines is rapidly increasing and the delivery position is getting better and better. The demand for the Big Baby has exceeded all expectations. No wonder—it has the cooking capacity of a full size cooker yet will work off any power point * and costs only £19.17.6d. The independently heated oven produces roasting and baking that's second to none in its class. In fact the results from this splendid cooker compare favourably with any cooker at any price.

* ***Patent interlocking device limits current automatically so that the cooker can be safely operated from a 13 amp power point.***
- ***Large independent extra quick heating oven. Thermostat available 35/- extra.***
- ***8" solid type boiling plate and combined grill-boiler.***
- ***Large hotcupboard for plates and food.***
- ***Useful plate warming compartment beside oven.***
- ***Supplied on Stand with utensil shelf—also available with 2-door Cabinet, 40/- extra.***
- ***Handy Towel Rail on either side of oven.***
- ***£19 · 17 · 6 including Stand—subject to usual Baby Belling discounts.***

## you can't beat a "Belling"

**Belling & Co. Ltd. Bridge Works. Enfield. Middx. Howard 1212**

CBC 430

NP24

Table top for Goodearl Bros., Television cabinet for Bush Radio and Fuse carrier for J. G. Statter are all made from phenolic material. The serving tray is resin impregnated paper with "Warerite" linen finish, giving hard service in Woolworth's canteens and many Service messes.

# *NATIONAL PLASTICS make them LARGE*

Obviously we can't make large mouldings without large presses and a tool-shop to make large moulds, but there's more to it than that.

A large moulding is not just a small moulding blown up — far from it. Problems of material flow, temperature and pressure are all different and more complicated.

That's why it is so much wiser to go to those who are making large mouldings all the time, as we are. The four articles shown here are all actual productions supplied in quantities to our customers. When you are thinking in terms of large mouldings ring Larkswood 2323 for practical advice and design assistance.

**NATIONAL PLASTICS**

NATIONAL PLASTICS (SALES) LTD. Sales organisation for BRITISH MOULDED PLASTICS LTD., Avenue Works, Walthamstow Avenue, London, E.4 . . . *LARkswood 2323*

# Your link with the best...

Take a lead from the leading industrialists—link your business with Brayhead finest quality components. As specialists in the manufacture of all types of springs, pressings, clips, I.F. cans, valve screening cans, valve shrouds and the revolutionary "Metpaks" shock absorbers Brayhead put quality above all—and at the right price.

**BRAYHEAD SPRINGS LTD**

**FULL VIEW WORKS · KENNEL RIDE · ASCOT · BERKS**

*Telephone:* Winkfield Row 427/8/9 *Telegrams:* Brayhead Ascot

87D

# Covers the entire engineering industry

When the next Engineering, Marine and Welding Exhibition and the Foundry Trades' Exhibition takes place at Olympia, in September, 1955, it will be 49 years since this important event was inaugurated. Since then the Exhibition has grown in size and prestige until it is now recognised by buyers of plant and equipment as the most important event in the Engineering Calendar.

The wide scope of this Exhibition is indicated by the fact that over 500 exhibitors are displaying their products under 800 classifications. Make a note of the date now—

*Organisers :*
**F. W. BRIDGES & SONS LTD.,**
*Grand Buildings,*
*Trafalgar Square,*
*London, W.C.2.*
*Telephone:* WHitehall 0568/9

**ENGINEERING, MARINE & WELDING EXHIBITION**
**AND THE FOUNDRY TRADES' EXHIBITION**
**September 1st to 15th, 1955**
**OLYMPIA · LONDON**

# *Welcome to the EAC new* **AUTETTE** *for FHP Motors*

Prominent in an entirely new range of EAC direct-on starters is the Autette (540 volts 1-2 & 3 phase) for motors up to and including ½ H.P.

The Autette, a highly standardised unit, makes available for small motors, a control unit giving triple pole overload protection and independent **single phasing protection** at a very competitive price.

*Write for leaflet 141, section 0/4*

## *The* **AUTETTE** *has the following features:—*

- Triple-pole switch (with heavy silvered contacts) mechanically operated by "on" and "off" push buttons.
- The new overload and single phasing preventor unit, the elements of which are indirectly heated by replaceable heaters.
- Visual indicator showing when switch is on.
- Simplified terminal clamp arrangements.
- Handsome die-case dust-protecting enclosure.
- Conforms fully to BS 587/40.

*EAC are the Single phasing Preventor People.*

**THE ELECTRICAL APPARATUS COMPANY LTD · ST. ALBANS**

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BIRMINGHAM · LEEDS · NEWCASTLE
BRISTOL · SWANSEA · IPSWICH

**MAKERS OF MOTOR CONTROL GEAR AND INSTRUMENTS FOR NEARLY HALF A CENTURY**

TRADE MARK

HIGGS MOTORS LTD.

MANAGING DIRECTOR DAVID C.Y. HIGGS, A.M.I.E.E.

BIRMINGHAM 6 ENGLAND

**HIGGS POLISHING MOTORS**
**from stock**
**Pedestal or Bench Mounting**

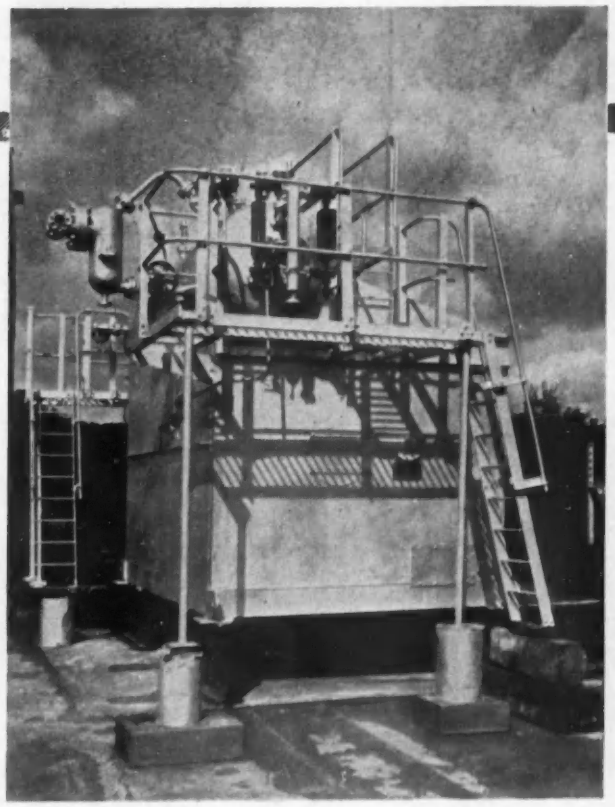
**GUARANTEED *for* EVER**

Belfast · Bristol · Cardiff · Dundee · Glasgow · Hull · Leeds · Liverpool
London · Manchester · Newcastle · Peterborough · Sheffield · Wolverhampton

# FOSTER WHEELER

## *Package Boilers*

**FOR RELIABLE AND ECONOMIC SUPPLY OF STEAM**



*Foster Wheeler Package Boiler supplied to the India Store Dept. Capacity 9,500 lb/hr. at 600 p.s.i.g.*

- Water tube design
- High efficiency
- Minimum heat loss
- Easily transported
- Quickly installed
- Wide range of capacities
- High steam temperature
- Oil and/or gas fired
- Rapid load response
- Good accessibility
- Low cost foundation
- Suitable for outdoor use

The boilers are available as rugged factory assembled units in capacities from 1,500 to 15,000 lb/hr. for pressures up to 825 p.s.i.g. Larger units up to 30,000 lb/hr. are available for erection on site.

FW

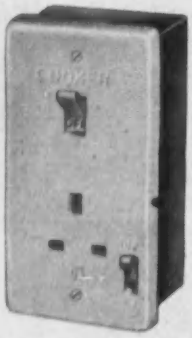
**FOSTER WHEELER LIMITED**

FOSTER WHEELER HOUSE, 3 IXWORTH PLACE, LONDON S.W.3.

# OUTSTANDING SUCCESS!!!

## COOKER CONTROL UNITS

SURFACE AND FLUSH PATTERNS



**FLUSH PATTERN**

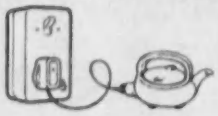
Overall Dimensions:
$6\frac{9}{16}" \times 3\frac{1}{8}" \times 1\frac{1}{8}"$
(Projection with Plug)
Dimensions of Box:
$6" \times 3" \times 2"$
PRICE EACH — 31s.
including D.S. Fused Plug.

**SURFACE PATTERN**

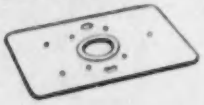
Overall Dimensions:
$6" \times 3\frac{1}{16}" \times 2\frac{11}{16}"$
(Projection with Plug)
PRICE EACH — 27s. 4d.
including
D.S. Fused Plug.

Architects, consultants and municipal authorities have quickly seen the advantages of these new Cooker Control Units. Electrical contractors and builders appreciate their easy installation and trouble-free servicing.

● Streamlined, styled to suit modern kitchen interior ● Ivory plastic cover of thick section with contrasting red switch operating levers—positive "ON-OFF" indication ● Compact design provides simple installation ● Complete safety for users ● Easily cleaned ● Main switch 30 Amp DP-AC with large silver rivet contacts ● Auxiliary circuit 15 Amp. DP-AC switch socket outlet to B.S.S. 1363/1947. Switch contacts break on both poles for added safety.



Auxiliary circuit for use with kettles and other electrical kitchen appliances.



Adaptor plate for surface type provides concealment of supply and outgoing cable.

This new DS range of quality products represents the highest possible value in up-to-date Cooker Control Units. Other types are available in cream stove enamelled finish.

SEND FOR CATALOGUE DSP.2.

**D.S. PLUGS LTD**

MANCHESTER 5 and SALTERBECK, WORKINGTON. Also at LONDON, GLASGOW, BELFAST, LEEDS, CARDIFF, NEWCASTLE, BIRMINGHAM.



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SELENIUM METAL RECTIFIERS

AUTOMAT CO. 366 MOORSIDE ROAD, SWINTON, NEAR MANCHESTER. TELEPHONE: SWINTON 2765.

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EETO SERVICE IS PROMPT AND EFFICIENT

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IN SECTIONS FOR EASY FITTING CONNECTING PIPES OFFER NO DIFFICULTY

Jackets available for Horizontal Cylinders, Rectangular and Square Tanks.

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Tel: BOLTON 3764.

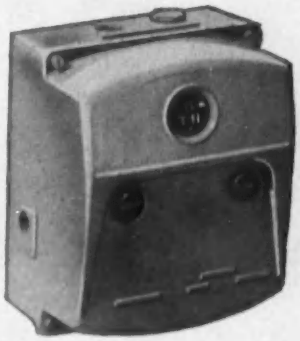
CW1088/14c.

B T-H

# CONTACTOR STARTERS

## for squirrel-cage motors up to 35 h.p.

| TYPE | 200/250v | 346/380v | 400/440v | 500/550v |
|---|---|---|---|---|
| DOC 71 | 3 h.p. | 4 h.p. | 5 h.p. | 5 h.p. |
| DOC 175 | 5 h.p. | 7½ h.p. | 10 h.p. | 10 h.p. |
| DOC 402 | 15 h.p. | 25 h.p. | 30 h.p. | 35 h.p. |



DOC 71

*Delivery from Stock*

DOC 175

DOC 402

British Thomson-Houston offer an exceptionally wide selection of hand and automatic motor-control gear—direct-on-line, star-delta, auto-transformer, rheostatic, and electronic.

*Member of the AEI group of companies*

THE
**BRITISH THOMSON-HOUSTON**
COMPANY LIMITED, RUGBY, ENGLAND

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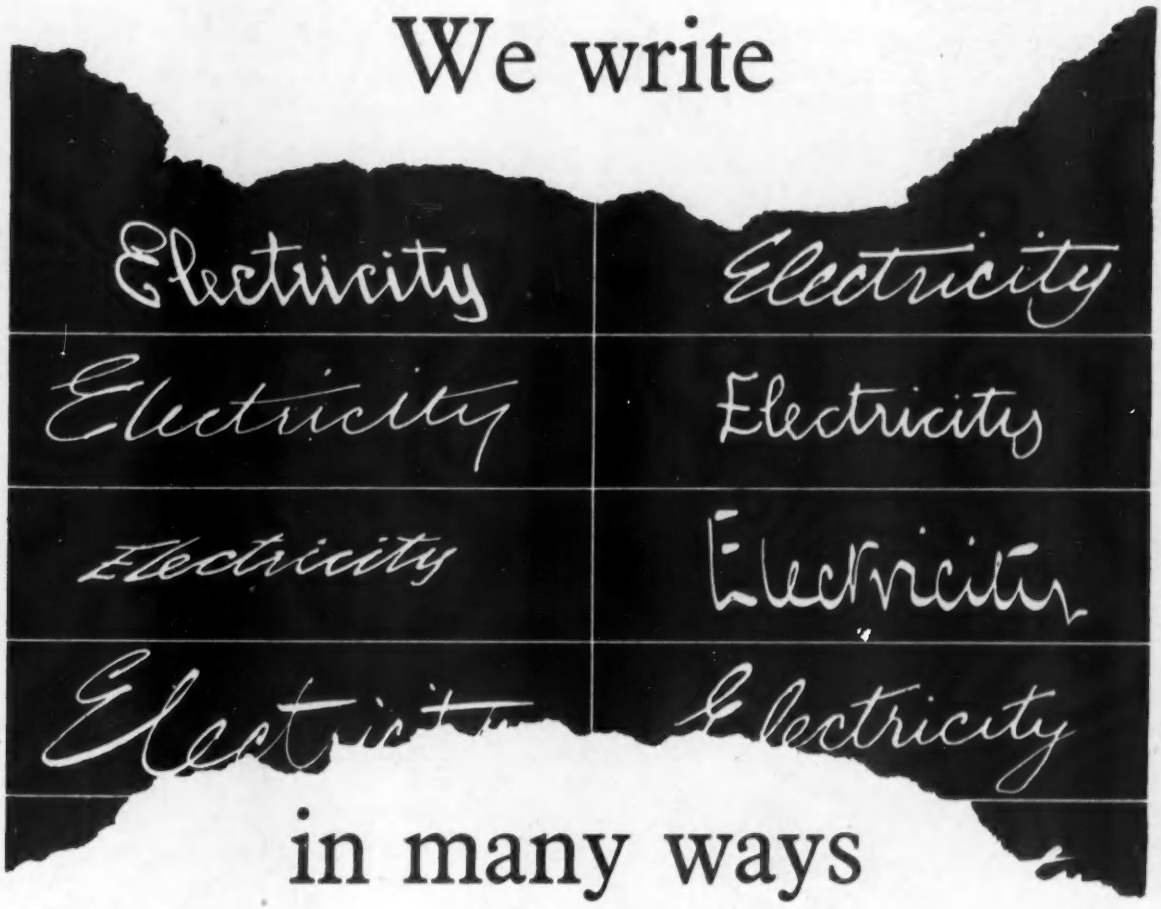
# Cut 20% off volume, weight and price!

Highly efficient, easily maintained and competitively priced the new Brush Square Path Alternators are designed *exactly* to meet the needs of modern industry. They are built in a wide range of sizes with outputs from 1½ to 35 kVA, self regulating, self exciting. Compared with orthodox alternators with overhung exciters they have higher efficiency, lighter weight and smaller dimensions. Brush Engineers are specialists in designing self regulated alternators (1½ to 35 kVA) and externally regulated alternators (1½ to 32 kVA) as reliable components for generating sets. And all Brush built alternators can be bought complete with Control Switch Gear. Write today for our latest catalogue and publications.

**You get exactly what you want from BRUSH**

BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED, HOPKINSON WORKS, CARDIFF. MEMBER OF THE BRUSH GROUP

# We write




# in many ways

**but our spelling is invariable**

Every day of the year we write or type the word *electricity* many thousand times. On paper, the word may always look the same but, in fact, electricity appears to us as twelve different entities. The twelve sections of the Crompton Parkinson organisation each have a specialist job to do. Between them they cover every aspect of electrical equipment and installation. United they provide the customers of Crompton Parkinson with the finest electrical service in the world.

**When it comes to electrical equipment . . .**

**you've got to hand it to Crompton Parkinson LIMITED**

ELECTRICAL EQUIPMENT

MAKERS OF ELECTRIC MOTORS OF ALL KINDS · ALTERNATORS & GENERATORS · SWITCHGEAR · B.E.T. TRANSFORMERS · CABLES INSTRUMENTS · LAMPS · LIGHTING EQUIPMENT · BATTERIES · STUD WELDING EQUIPMENT · TRACTION EQUIPMENT · CEILING FANS

CROMPTON PARKINSON LTD · CROMPTON HOUSE · ALDWYCH · LONDON · W.C.2 · TELEPHONE: CHANCERY 3333

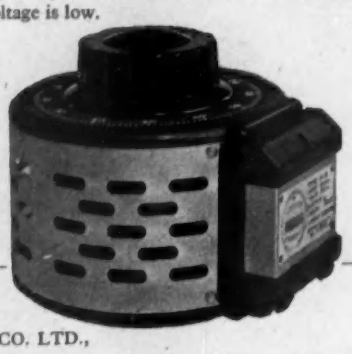
## There's much to be said for . . .

**CONSTRUCTION:** Toroidally wound auto-transformers, with tracks formed on one face of the windings.
**CORE:** Wound from a continuous strip of low loss electrical steel in a similar manner to the well-known C core construction.
**INSULATION:** Specially processed plastic mouldings ensure minimum shrinkage due to heat and continuous use, and prevent any possibility of the turns slackening.
**WINDING:** Of high conductivity copper, insulated with a synthetic enamel of the polyvinal acetal-phenal formaldehyde resin type, giving good space factor, exceptionally high abrasion resistance and prolonged heating resistance.
**FRAME:** Of die cast aluminium, incorporating long spindle bearings and mounting feet to ensure accuracy and rigidity of the mechanism in relation to the fixing holes.
**BRUSHES:** The brushes are of a special carbon chosen for its contact resistance characteristics, shaped to give minimum loss, maximum strength and longest life.

*There are 4 models of the Berco Rotary Regavolt available :—*

| Model | Max. Input Volts at 50/60 cycles | Max. Output Voltage Range at no load | Rated Current | Weight | PRICE £ s. |
|---|---|---|---|---|---|
| 41A | 250 | 0–250 | 0.8 | 4½ lbs. | 6 12 |
| 41B | 115 | 0–135 | 2.25 | | |
| 42A | 250 | 0–270 | 2.0 | 6½ lbs. | 7 18 |
| 42B | 115 | 0–135 | 5.0 | | |

The Berco Rotary Regavolt provides a highly economical, compact and reliable means of obtaining a continuously variable output voltage, without the heat losses associated with resistances. Its outstanding advantage over resistance control is that any alternating current load within normal rating can be controlled from zero to full voltage without the necessity of special designing for individual applications. Thus, one rotary Regavolt can be used in place of a number of adjustable resistances. In addition, an increase in voltage, above the main supply, can be obtained with three of the four Regavolt models. This is an especially valuable feature when the supply voltage is low.



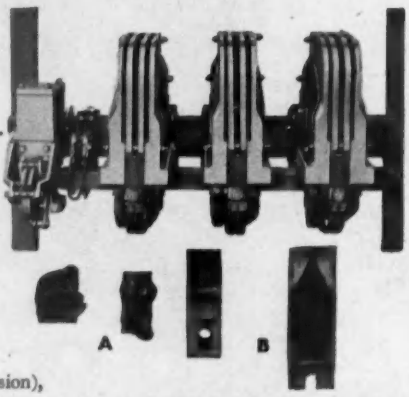
## . . . BERCO ROTARY REGAVOLT

BERCO

★ *For full details and prices write to:—*
THE BRITISH ELECTRIC RESISTANCE CO. LTD.,
Queensway, Ponders End, Middlesex. Telephone: HOWard 1492. Telegrams: Vitrohm, Enfield
*Specialists in the control of current and voltage for more than 25 years*
BR1251-AH

## "These G.W.B. contactors have lasted well—much better than the previous copper ones"

An important industrial organization using hundreds of machine tools had control gear trouble on a machine working on heavy plug reversing duty. When this machine is set up it plug reverses 60/85 times for the first thirty minutes and then settles down to steady running. The machine in question is used for short runs so that the punishing setting up procedure might take place two or three times per day. Conventional type control gear with copper contacts required to have the contact faces cleaned with emery cloth every day, filed every three days and replaced after three weeks. **The G.W.B. contactor unit which replaced it showed only slight wear after ten weeks operation and was not touched during this period.**




**G.W.B. CONTROL PANELS**
G.W.B. incorporate these special contactors in Control Panels of all types from simple units to complicated "tailor made" installations. In addition, G.W.B. offer complete design facilities and specialised advice for work of this description.
A are typical copper contacts after three weeks use. B are the long life G.W.B. contacts with the sintered tungsten-silver contact faces after seven weeks use under precisely the same conditions.

GWB

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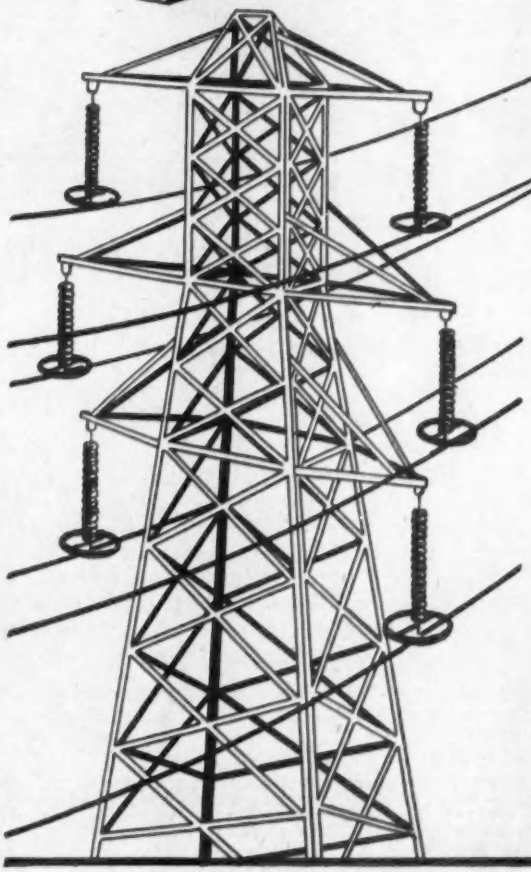

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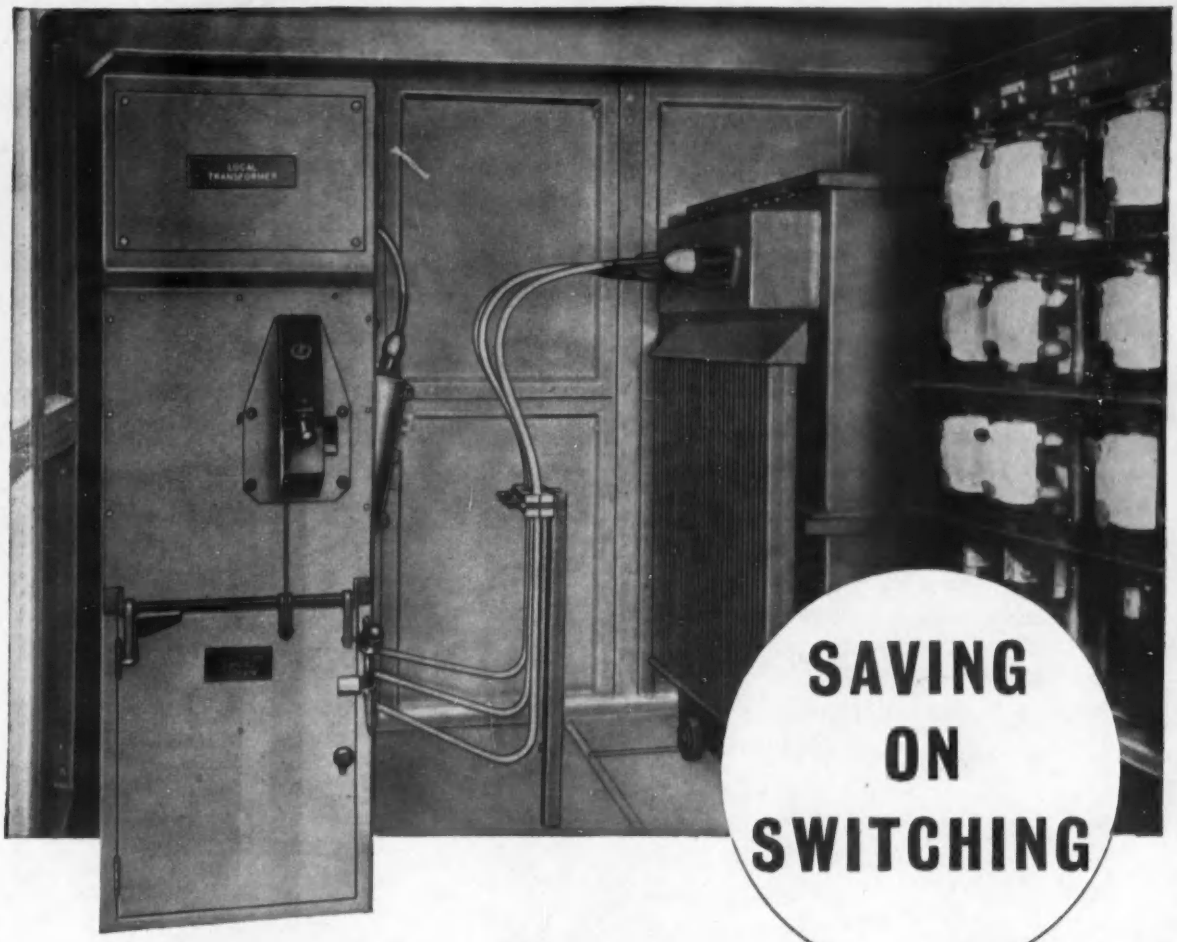

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**Here is a practical example of how the East Midlands Electricity Board save on sub-station costs, with a J. & P. Fuse-Switch Unit housed in a pre-fabricated concrete building.**

**The J. & P. Fuse-Switch is a simple, low-priced unit for systems up to 11 kV and up to 250 MVA, ideal for small installations where a circuit-breaker unit is not justified.**

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with air-insulated

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Air-insulated fuses have many advantages ; they can be easily inspected, there is no chance of oil entering the fuse cartridge, and fire hazards are reduced.

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A full complement of positive interlocks is provided, giving complete safety, and the interlocking mechanism is clearly visible so that the operator can observe the correct sequence.

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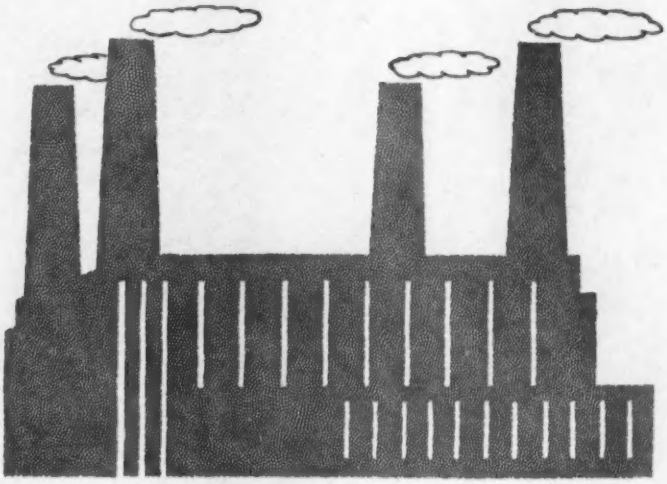
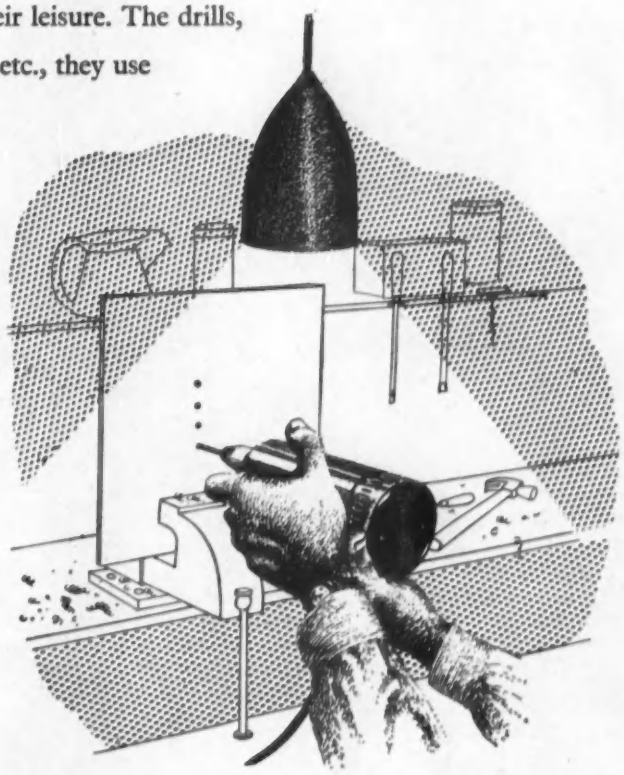


# *what is the connection?*

In millions of homes, workshops and garages, men and women employ many and varied power appliances to ease and speed their work and increase their leisure. The drills, lathes, sanders, polishers, cleaners, mixers, etc., they use depend on electricity for their power.



*AWCO Conductors provide the vital link between source and consumer. All-Aluminium low tension (240-415 volts) distribution lines supply the needs of these small users most efficiently and economically. Because aluminium conductor is up to 50% less in cost than its copper equivalent, erection is less expensive. Being half the weight of copper, aluminium conductors are easier to transport, handle and erect.*

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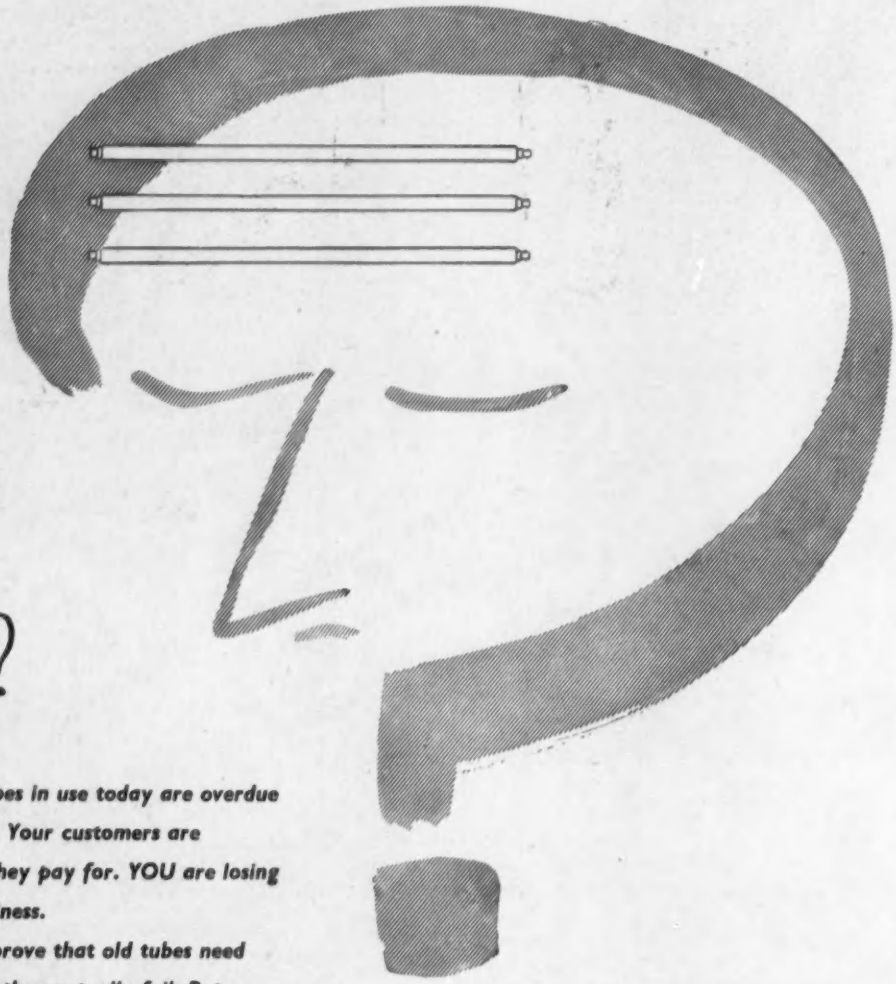

# Tried the tired tube test?

***Thousands of tubes in use today are overdue for replacement. Your customers are losing the light they pay for. YOU are losing replacement business.***
***Use this test to prove that old tubes need replacing before they actually fail. Put a few ATLAS 3,500°K 'White' Tubes into any existing installation. You'll be amazed at the difference—and so will your customer!***

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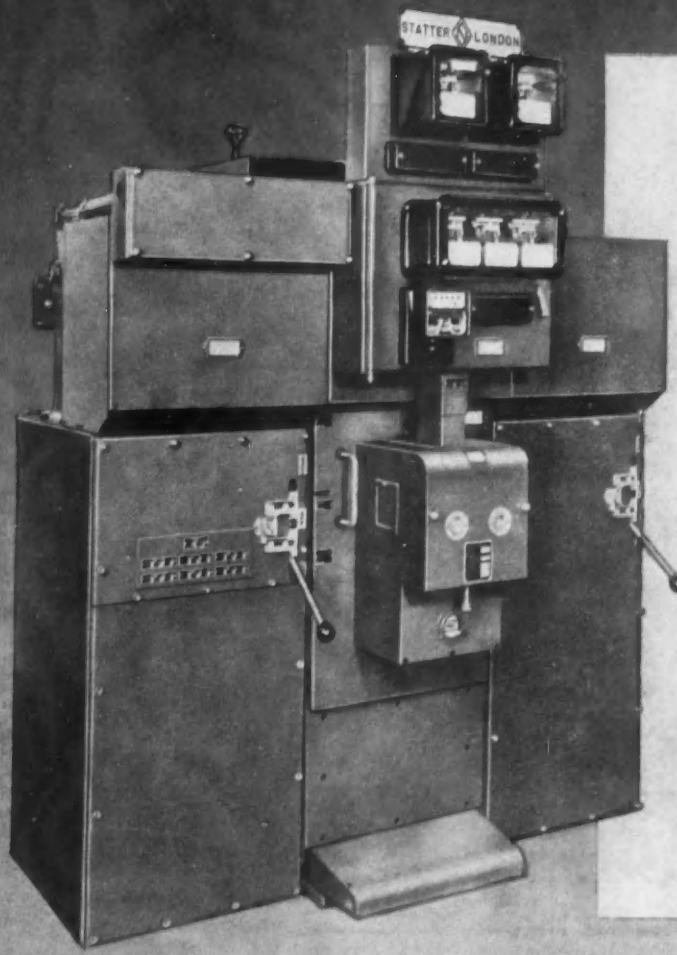


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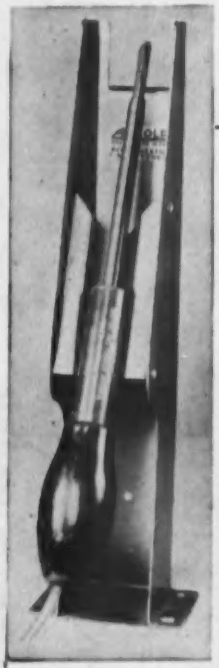

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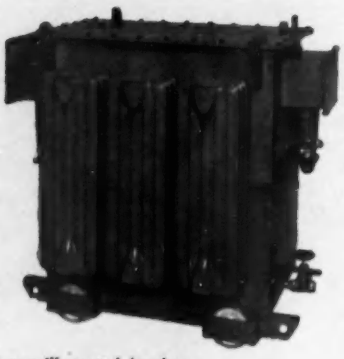

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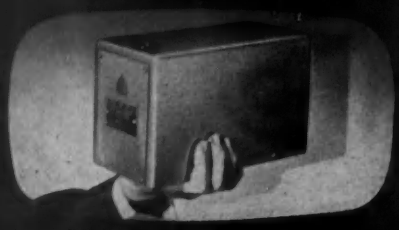

*The* ASR-1150 *Weighs* 11 lbs.
*Measures* 8½ × 4½ × 5 *Price only* £24

This new Stabiliser will handle loads up to over 1 kilowatt—having an output of 5 amperes at (usually) 230 volts. As a general rule it weighs only about 1 10th of the so-common "choke-condenser" types offered by some competitors.

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ASR-1150 is merely one of an entirely new range of A-C Stabilisers, ranging from 200 VA to as high as 50 kVA—all dealt with in Catalogue V-549-S.

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Wedge shaped inturned edges to take serrated grooves of "Unistrut" Nut.
"Unistrut" Locking Nut with serrated grooves.
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Rounded edges of nut permit easy insertion. Spring (your third hand) holds nut snugly in place for bolting.
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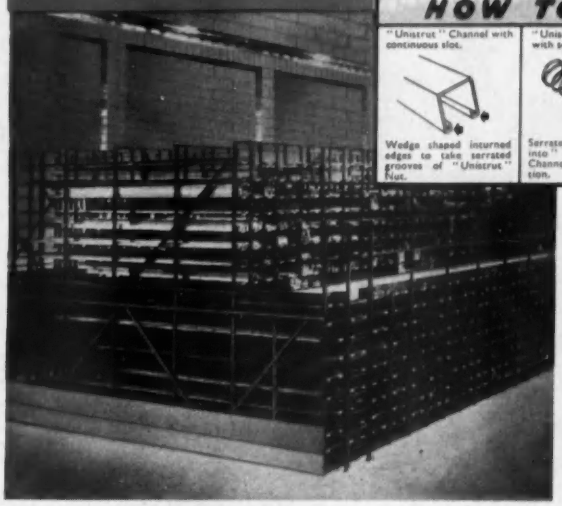

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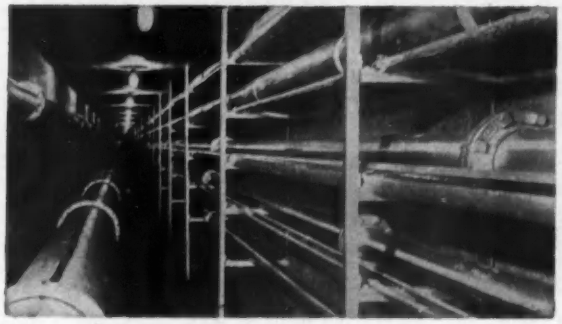
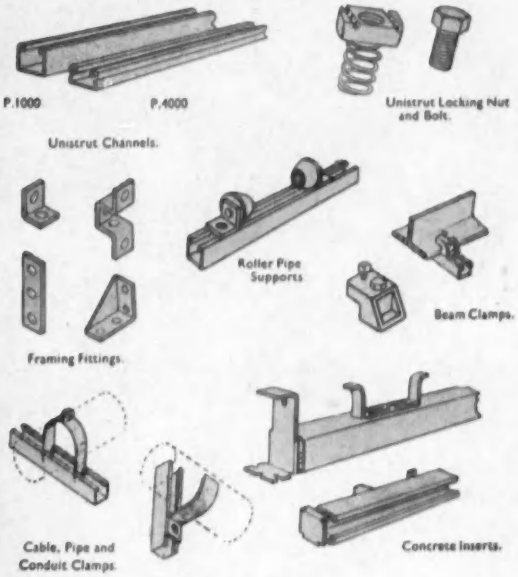
Time Card installation. Neat appearance, rigid construction. With Unistrut the fluorescent lighting problem is solved too !



Unistrut concrete inserts, Pipe clamps and metal framing in tunnel piping installation.

## Typical UNISTRUT fittings

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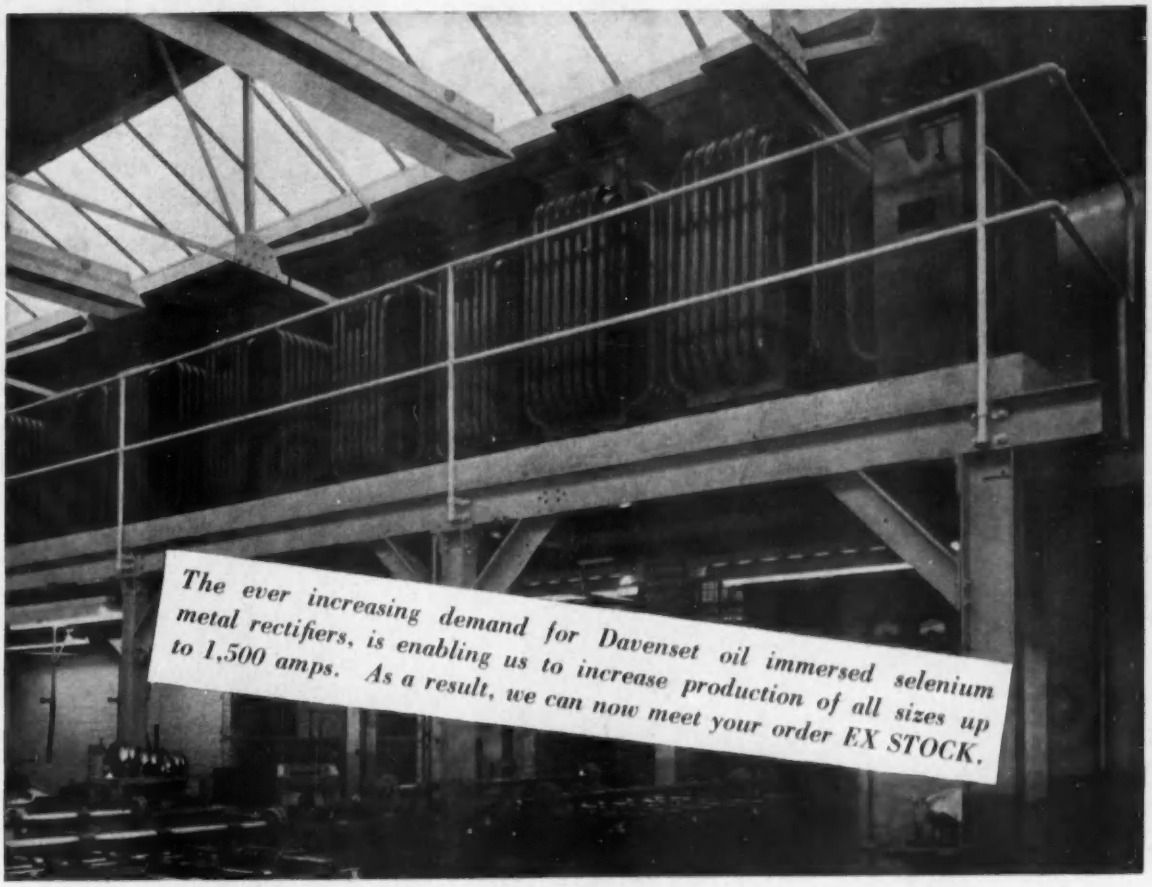
The ever increasing demand for Davenset oil immersed selenium metal rectifiers, is enabling us to increase production of all sizes up to 1,500 amps. As a result, we can now meet your order EX STOCK.

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* *The equipment was supplied by Roval Ltd., Brimsdown; photograph by courtesy of the Decca Record Company Ltd.*

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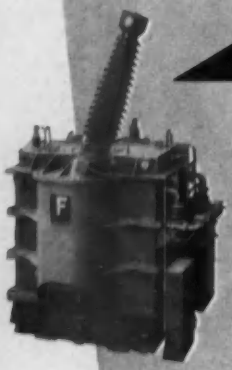
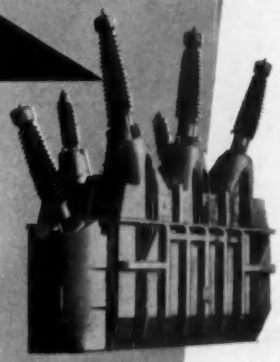
*FAMOUS THROUGHOUT THE WORLD*



**U.S.A.** Nine 33,333 kVA, 230,000 volt single-phase Ferranti transformers are being supplied to the U.S. Army Corps of Engineers for the Garrison Dam Project, North Dakota, U.S.A. Three, forming the first 100,000 kVA bank, have been shipped.

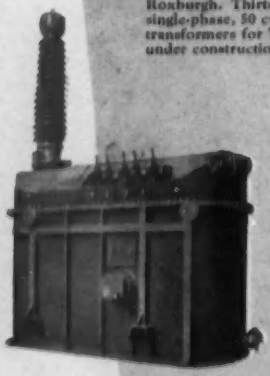
**FINLAND** Six 230,000 volt, three-phase Ferranti transformers have been ordered by the Imatra Power Company, Finland, for the Hikis Transforming Station and the Pyhäkoski Generating Station. Five are now in commission.

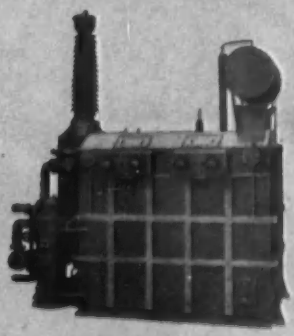


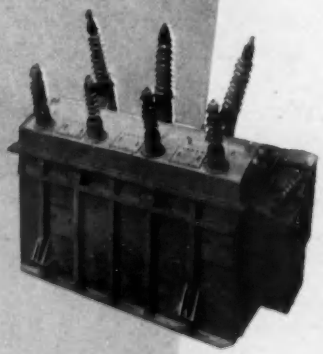
**NEW ZEALAND** Twenty-six Ferranti large power transformers have been ordered by the State Hydro-Electric Department of New Zealand. Thirteen 14,800 kVA, single-phase, 50 cycles, 11/220 kV transformers have already been supplied to Roxburgh. Thirteen 9,259 kVA, single-phase, 50 cycles, 11/220 kV transformers for Whakamaru are under construction.

**CANADA** Four 71,000 kVA, 301,400 volt single-phase Ferranti generator transformers and three 37,000 kVA, 275,000 volt step-down Ferranti transformers have been supplied to the Aluminum Company of Canada Limited for the Alcan Project at Kemano and Kitimat, British Columbia.

**INDIA** Three Ferranti 20,000 kVA, OFB, 3-phase, 50 cycles, 132/33.66 kV Transformers with on-load tap changing gear and two Ferranti 10,000 kVA, ON/OB, 3-phase, 50 cycles, 132/33 kV transformers with on-load tap changing gear have been supplied for the Damodar Valley Power Scheme in India.







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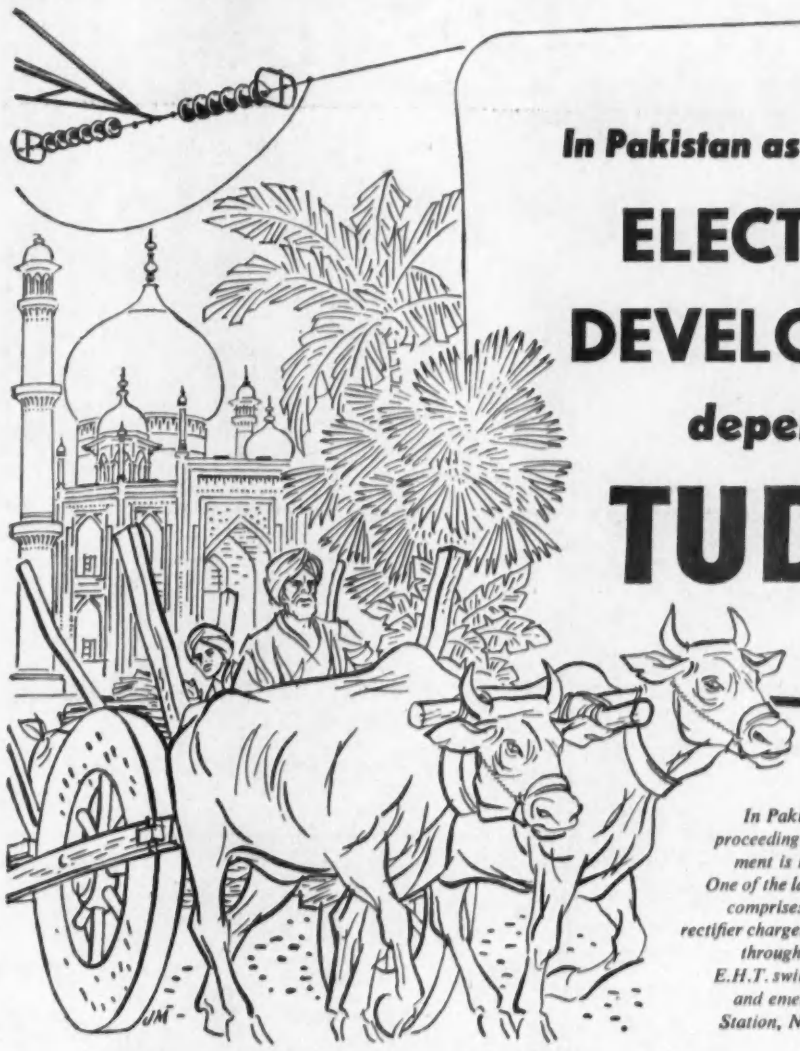

*In Pakistan as in Great Britain*

# ELECTRICAL DEVELOPMENT *depends on* TUDOR

*In Pakistan, where electrification is proceeding apace, Tudor Battery equipment is making its contribution. One of the latest Tudor export shipments comprises a 230 volt battery and combined rectifier charger/D.C. switchboard supplied through Ferguson Pailin, Ltd. for E.H.T. switchgear operating, indication and emergency duties in Dargai Power Station, North West Frontier Province.*

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T.125

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My Daddy (whom you can't see because he is taking a photograph of me) says that people who sell saucepans must be fed up with reading advertisements about saucepans.

He says that they know which are the best by their feel, their look, their price, and the way they sell.

He says that these particular saucepans have a wonderful reputation.

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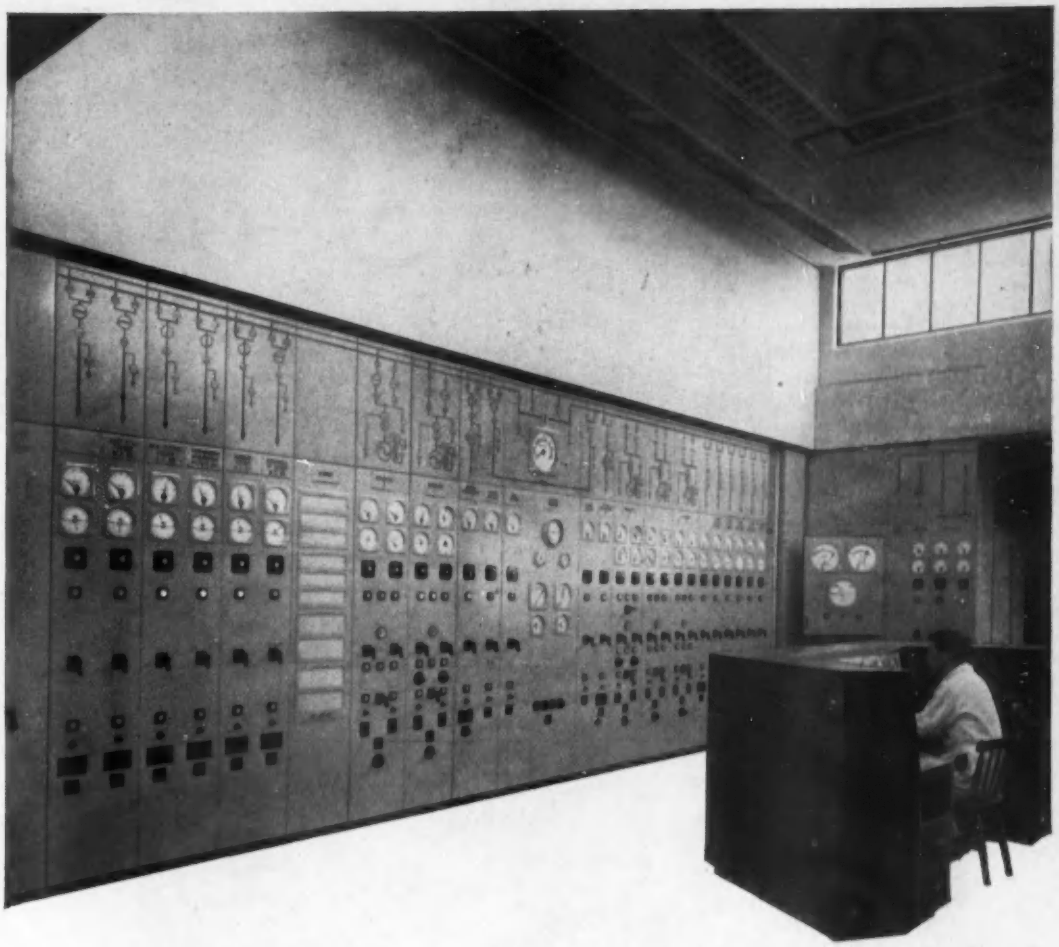

*Photograph by courtesy of the Belfast Corporation Electricity Department*

**Switchgear control-room at the Belfast Municipal Electric Power-station West**

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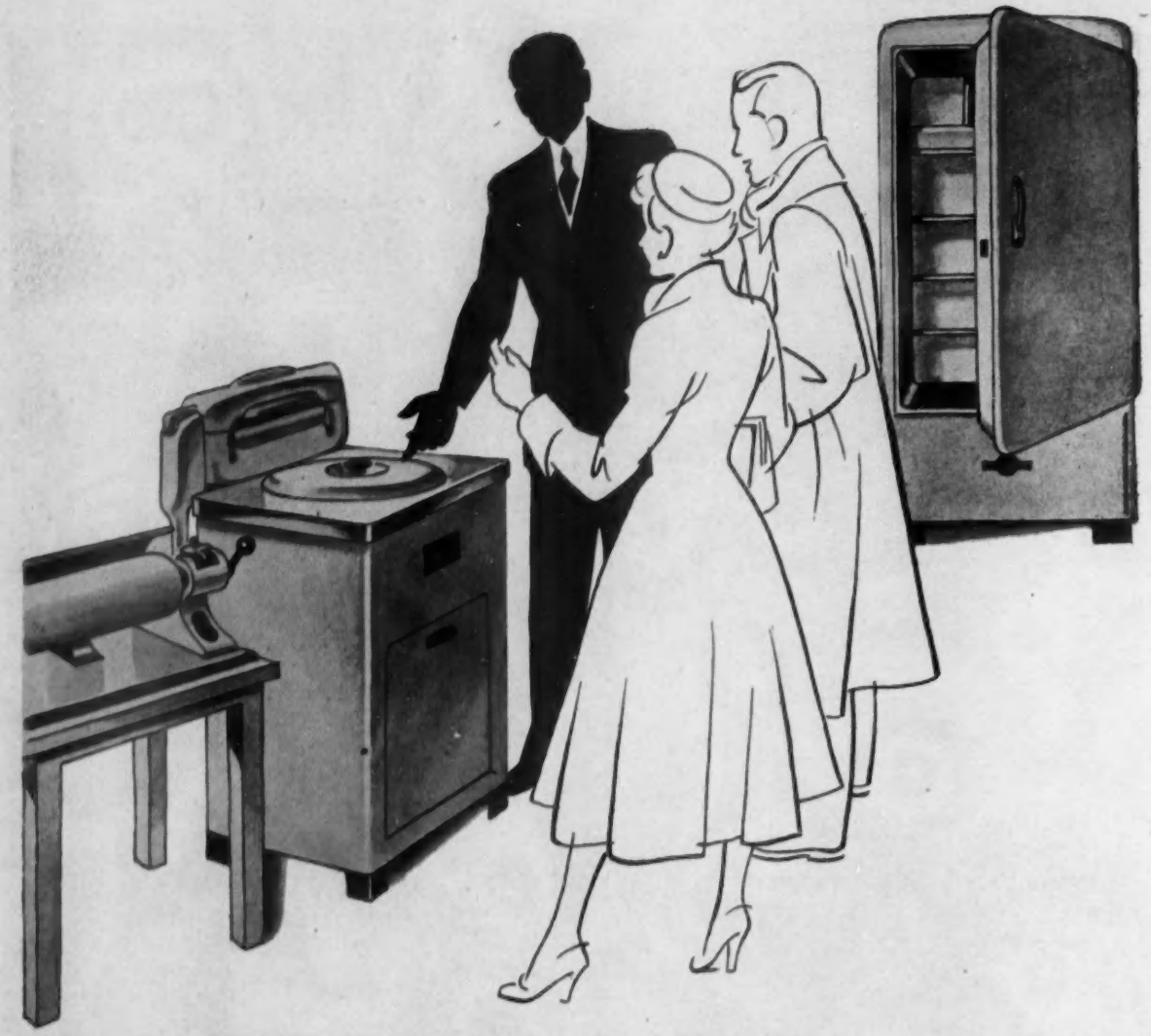

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Be sure to consult Bryce before ordering Power Transformers.

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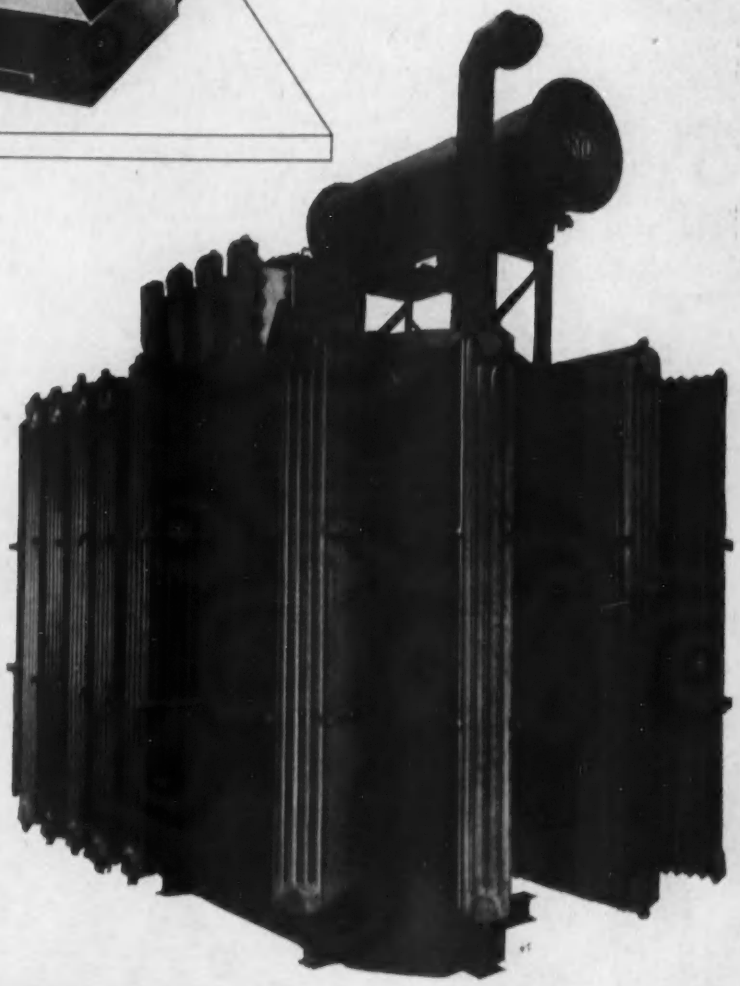
Larger transformers can be built up to 15000 kVA at 132 kV.



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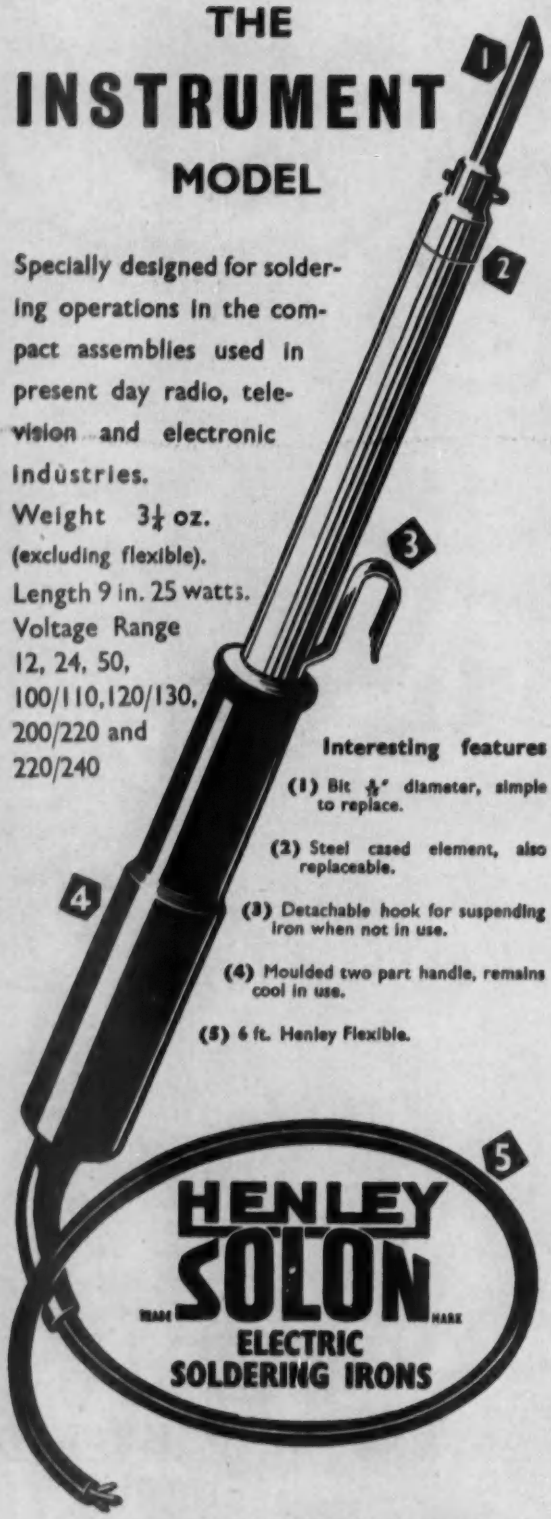


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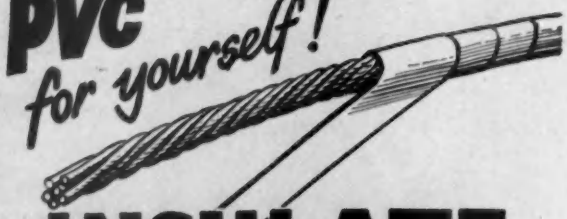

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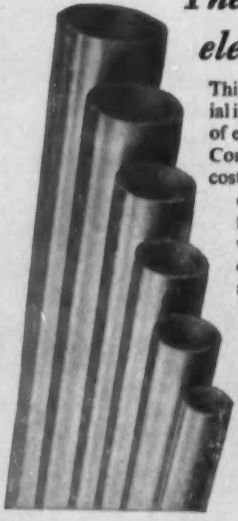

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*The illustration above shows Key Fibre Conduit laid on a bridge by Westminster Electric Supply Corporation Ltd.—45 years ago.*

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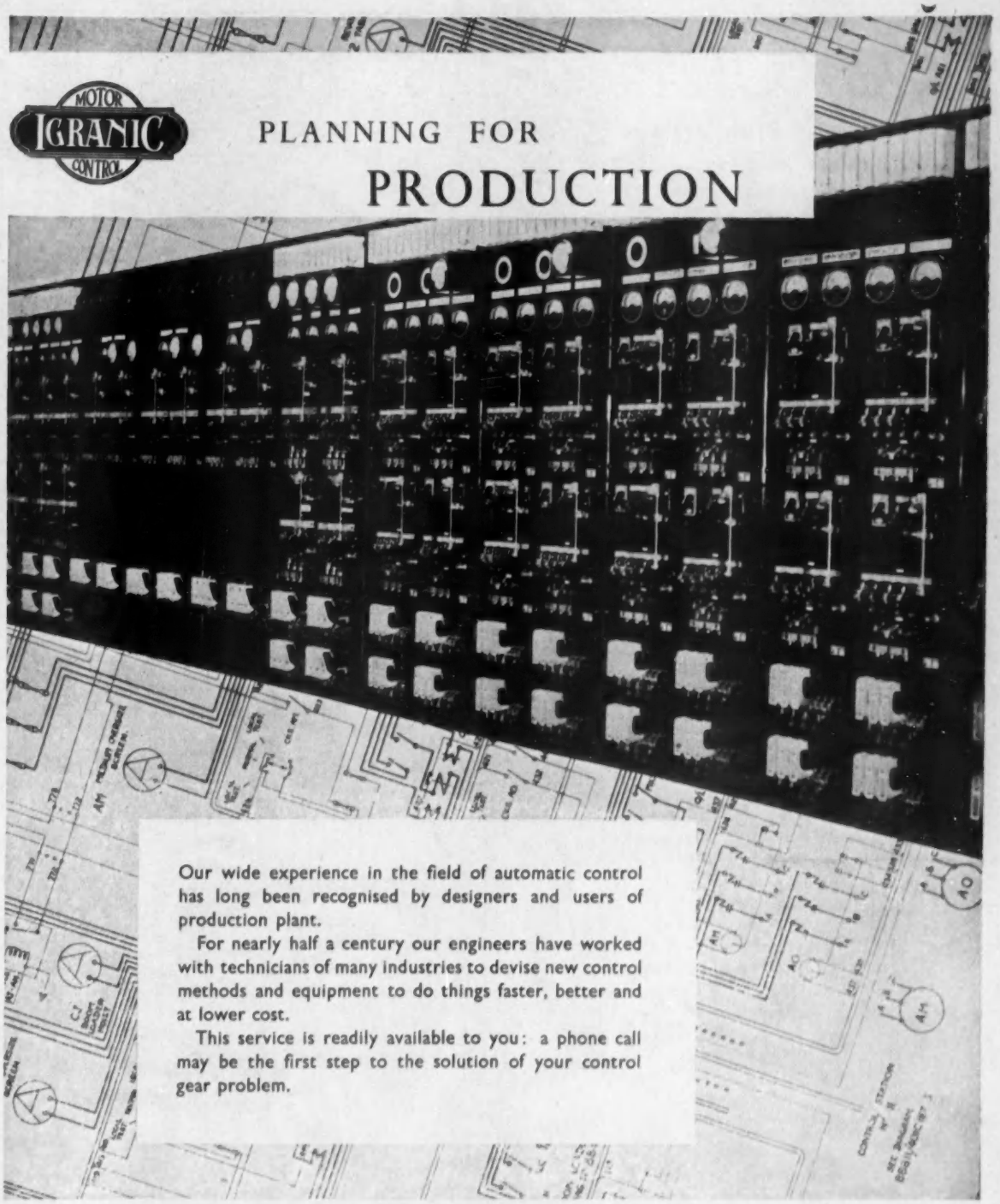

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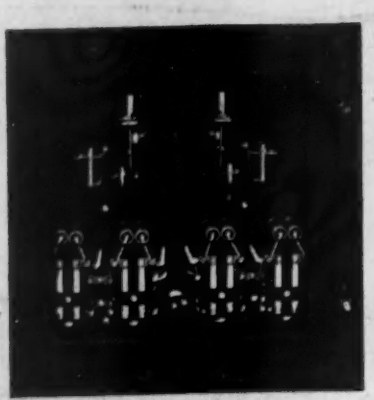

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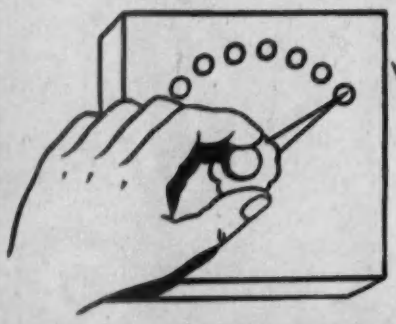

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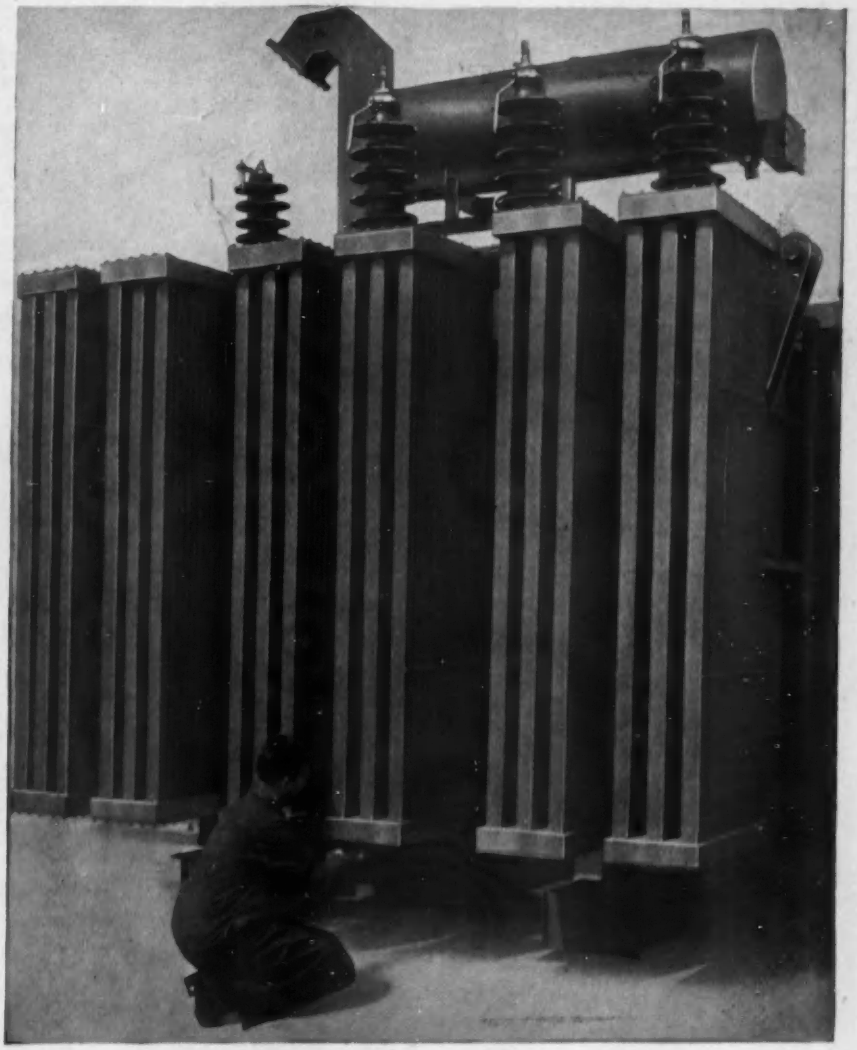

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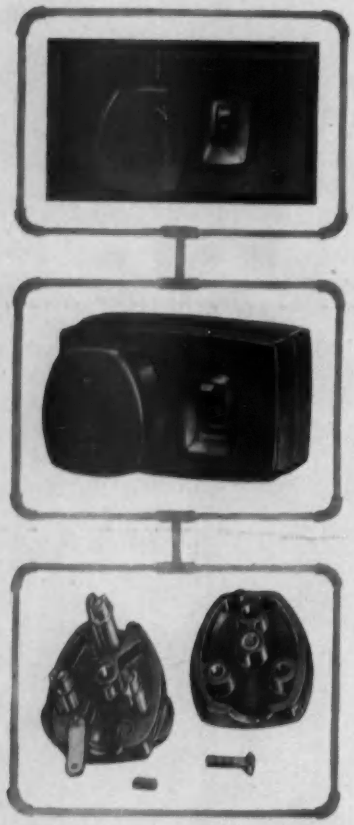

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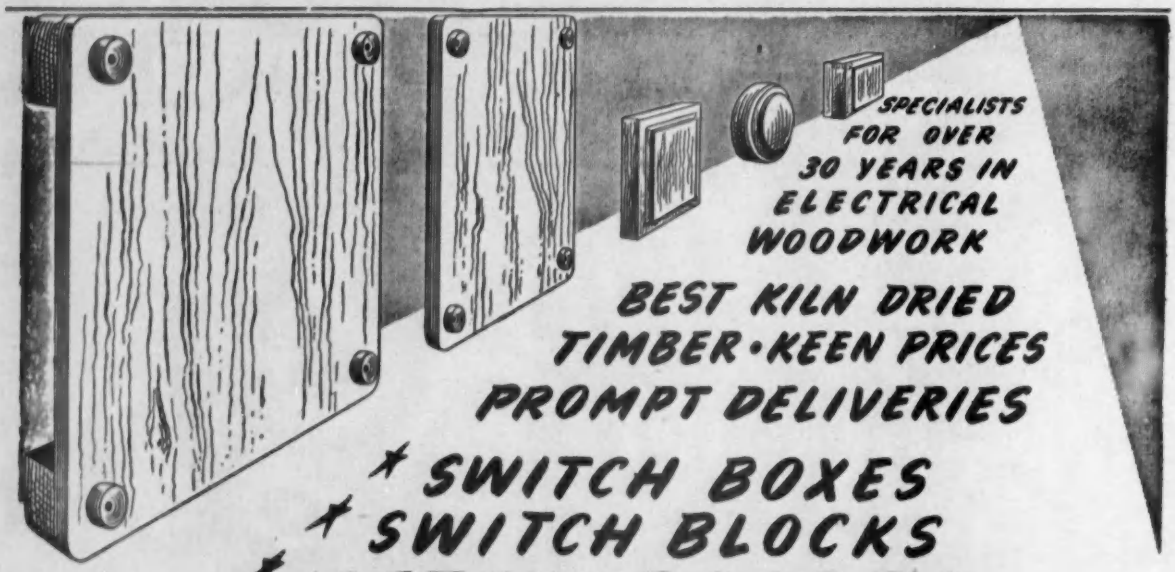


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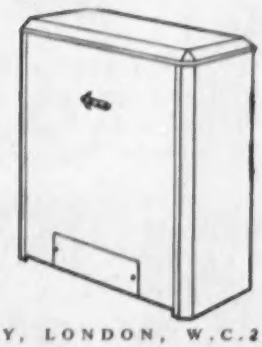

***Plan your winter heating installation NOW!***

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A G.&C. PRODUCT

***stores heat at night for use next day***

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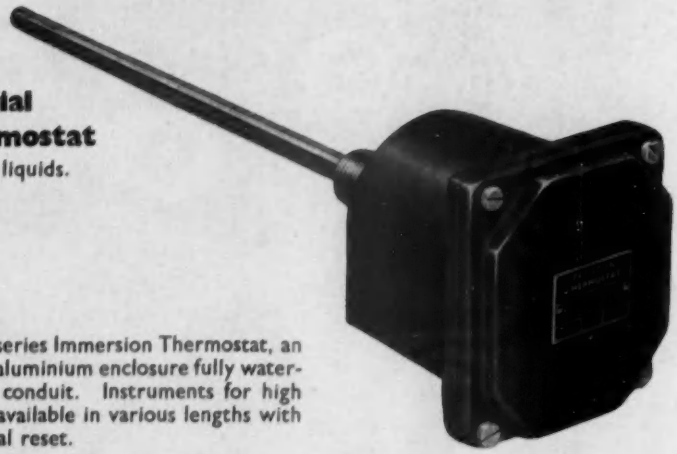
**Watertight**
**Pattern Industrial**
**Immersion Thermostat**
for water, oil or other liquids.



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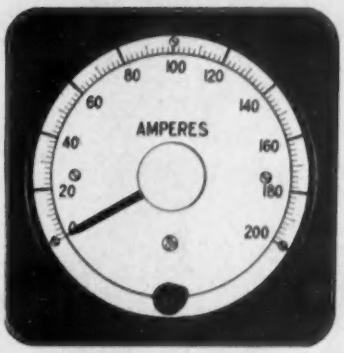

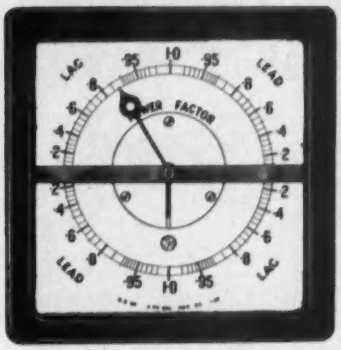

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- Pedestal centres 3 ft. 9 ins.

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# ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 11 AUGUST, 1955
Volume No. 128 Number 3327
REGISTERED AS A NEWSPAPER



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## TRADE FROM THE NUCLEUS

While official delegates and advisers of many nations at the U.N. sponsored Conference on Peaceful Uses of Atomic Energy are meeting this week at one end of Geneva, their commercial compatriots will be active at the other end of the city, pushing their wares in the first nuclear trade fair. Stakes are big in this brand new field of salesmanship, for in the next two decades most of the world will want nuclear equipment in one or other of its many forms, but only the most highly industrialised countries are potential suppliers. Great Britain is in the forefront of the exhibition, and at the end of last week came two news items which are encouraging for the hope of equal prominence when nuclear trade returns become yearly topics. Most striking was the statement by Lord Chandos that the A.E.I.—John Thomson nuclear energy group have already received enquiries for the supply of a nuclear power station overseas, and the incidental information that on certain specific research reactor designs, the U.S. can be underbid. This readiness to talk prices is a new feature in nuclear advance which marks the beginning of effective commercial operation. But lower prices will not necessarily sell against more advanced designs, and reports from the U.S.A. have from time to time suggested that faster progress was being made there with the more advanced and efficient types of reactor. On this point there is some reassurance in last week's speech by President Eisenhower's nuclear energy personal representative who said that "no country had made greater progress in developing peaceful uses of the atom than Britain." The statement is equivocal, and the occasion was polite, but its inference is none the less reassuring. The Geneva sessions which will have begun by the time this note reaches our readers should clarify the position further—but undoubtedly for Britain, the nuclear exports future beckons brightly. A word of warning needs to be sounded, however. The announcement by Admiral Strauss that the United States will make available at specified prices 200 kilograms of enriched uranium 235 and also heavy water for those countries which have concluded bilateral agreements with the United States, may well provide a powerful weapon in capturing overseas markets.

## 75 MW GAS TURBINES WANTED

The promise held for the large gas turbine generator in the immediate postwar years has up to the present been somewhat disappointing. In this country, apart from prototype designs in the 15 to 25 MW class, the size of proven machines lies in the

smaller sizes up to 10 MW. Yet there exists a potential market for really large machines. Mr Ingledow, Vice-President of the British Columbia Electric Co., is reported to have placed before British manufacturers a positive requirement for sets in the 75 MW category. These are to be used as standby units against possible failure due to avalanche, landslide and winter storm of the B.C. transmission system which is largely powered by hydro-electric plants. Such standby equipment, capable of being brought into operation at short notice, is particularly important on this system as the predominent industrial development of electricity in the region lies in metal extraction and processing where power failure for a few hours can lead to heavy production loss and delay. The need for such large gas turbines is more obvious since natural gas is becoming available in substantial quantities not only in Canada, but in Middle East oilfields where natural gas is at present being burnt to waste. Already continental firms are increasing the size of gas turbine units available, but they are still far short of Mr Ingledow's requirements. The limiting factor in the larger size still seems to be development of blade materials to stand up to continuous operation at high temperatures under mechanical stresses imposed by centrifugal force and vibration. With the considerable amount of metallurgical research being carried out in this country, will our own manufacturers be able to meet this demand?

## POWER FROM THE IONOSPHERE

The recent publication of American, Russian and British plans to establish within the next few years temporary artificial satellites which will provide data on conditions in regions immediately above the stratosphere, has more than a passing interest to the electrical engineer. Speculation has for many years been rife as to the electrical potentialities and conditions in the different geophysical layers. Indeed at the last World Power Conference, held in Rio de Janeiro, papers were presented estimating the amount of energy available. Mr Hugh Melzer, for example, came to the conclusion that within the layer lying between 30 and 300 miles above the earth's surface there existed an energy potential of the order of 306 x $10^{18}$ kWh. In the absence of adequate data such a computation was necessarily based on assumptions of substantial proportions. The artificial satellite project, however, may well provide the needed information which will verify or nullify the deductions that have been made about ionospheric electricity. The range of measurements which can be made will, of course, be dependent on the instrumentation it is possible to pack into the restricted space available. Should, however, it be shown that power is present in large quantities, tapping it will still present a major problem. It may be that this will exercise the ingenuity of editors of "junior" editions of newspapers, when space travel has entered the realms of the commonplace.

## CUT-THROAT COMPETITION

With over one in ten men using electric razors and with sales continuing at a high level, the electrical industry will have to give serious thought to means for supplying this new electrical appliance. First comes the need to use the razor in the bathroom, a practice which every electrical engineer will condemn as unsafe, yet it is one for which a special plea was recently made in the House of Lords. It is unlikely that hotels or indeed private users will face the cost of a double-wound transformer, yet wherein lies the safe alternative? Even when safety considerations are settled, there remains the contentious question of what type of socket-outlet is to be used. At present the unfortunate user of an electric razor may be faced with any one of four different sockets and in unfamiliar surroundings usually relies on the ubiquity of b.c. lampholders if he possesses the necessary adapter. Obtaining a suitable supply is further complicated by the large number of razors sold with the American flat two-pin plug already vulcanised on the lead, and in some cases where progressive hotels fit special sockets for razors and in aircraft and other situations, the American standard outlet is being installed. The whole position is extremely confused and the time has clearly been reached when the electrical industry should give authoritative guidance on the provisions that should be made for supplying this increasingly popular appliance.

## DISTRIBUTION CONTROL IN YORKSHIRE

Low Road substation of the Yorkshire Electricity Board, which we describe in this week's leading article, is an example of the integration of three major functions. In addition to supervising no less than 200 MW to supply the south Leeds area, it provides a focal point for the general operational control of the extensive high voltage system administered by the Board. Thirdly, the substation is equipped for supervisory control of satellite substations. This large transforming station originated with the City of Leeds Electricity Department, and when the project was taken over by the Yorkshire Electricity Board after vesting day, the opportunity was taken to add the control features for which the station was well sited. During the period of power shortage when the substation was in partial operation, the supervisory facilities proved of great value, although they are now used under normal conditions. They provide the ease and rapidity of control which such a large system demands leading in turn to a saving in manpower and improvement in efficiency of operation.

## IMPROVING EFFICIENCY ON SITE

Heat consumption trials at Carrington Generating Station have served to highlight the importance of balancing the value of vacuum against circulating pump motor consumption. These trials showed that under certain conditions the saving in auxiliary power made by shutting down one of the four c.w. pumps serving the two 60 MW sets, amply outweighed the consequent loss of efficiency from higher exhaust pressure. In the trials, No. 1 set (900 lb/sq in. 900° F) returned a steam consumption figure of 8,941 B.T.U./kWh according to Mr G. Woodhead in *Northern Lights*, the monthly magazine of the North West, Merseyside and North Wales Division. This figure is remarkably low, and although it was obtained under favourable conditions, it serves to show that there is still much to be saved by correct plant operation.

Meteor

# Low Road 132/33 kV Substation

## YORKSHIRE BOARD ESTABLISHES CENTRALISED CONTROL OF A LARGE DISTRIBUTION SYSTEM

THE Leeds electricity distribution system has been extensively reinforced since the war to cater for rapidly increasing loads in the area. A large scheme was commenced by the City of Leeds Electricity Department prior to vesting for the establishment of a major 132/33 kV substation in the southern part of the city and several 33/6·6 kV substations each equipped with 2—20 MVA transformers and associated 33 kV and 6·6 kV switchgear, feeding into the existing 6·6 kV network.

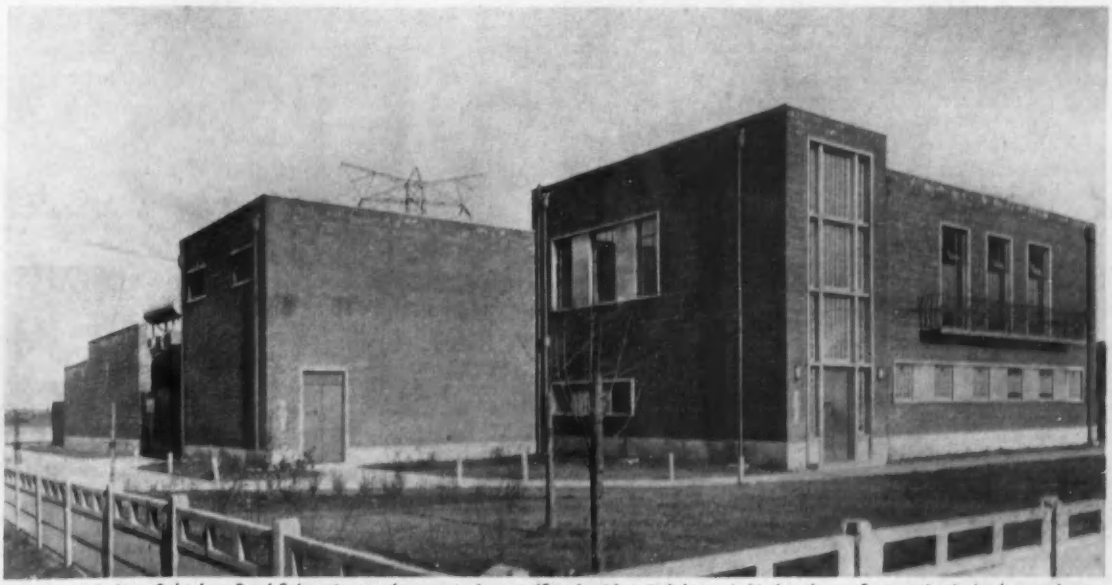
It was necessary for the supplies in the southern part of the city to be reinforced from Skelton Grange Power Station and this involved crossing extensive railway sidings, a river and a canal. The practical difficulties of negotiating these obstacles with a considerable number of 33 kV cables led primarily to the decision to effect the crossing overhead at 132 kV and to construct a 132/33 kV substation on the city side of the obstacles at Low Road to form a focal point for the main 33 kV distribution.

Subsequent to vesting the scheme has been completed in a modified form by the Yorkshire Electricity Board, Low Road being commissioned in 1953. The principal modifications at Low Road comprised the installation of single-busbar 33 kV switchgear and the establishment of a system control centre. Although the design and construction of 132 kV schemes is normally the responsibility of the Central Authority, when the Yorkshire Electricity Board took over the scheme it was agreed with the Authority that, since many of the contracts had been placed, the Board's engineers should complete the work including the Skelton Grange-Low Road 132 kV line and the associated transformers at Low Road. The whole of the design work was, therefore, carried out by the Board's Head Office electrical and civil engineering and architectural staff in collaboration with the Yorkshire Division. Following commissioning, the 132 kV line, the transformer compound and the transformer 33 kV circuit-breakers were transferred to the ownership of the Authority for purposes of operation and maintenance.

For the sake of clarity we have divided the following description of Low Road substation into two main parts, one dealing with the substation proper and the other with the system control centre and the control equipment, although operationally the two are closely related.

### *Site and Building*

The selection of a site for a large substation in a dense urban area presents considerable difficulties and the site finally obtained lies on the main Wakefield road in an area of Leeds scheduled for redevelopment. As is customarily the case the building elevations and form of construction had to conform with the requirements of the planning authorities. Due to rather severe space limitations on the site it was necessary to design the building in the form of a two-storied structure, a cable basement being provided for the main 33 kV cables and the multicore control cables. The frontal appearance of the building can well be seen from the general photograph. The 33 kV switch-house, which can be seen on the left of the picture, extends the full length of the building at the rear. The front portion contains the relay, battery, auxiliary plant and supervisory apparatus rooms on the ground floor with the system control, telephone, mess and senior control engineer's rooms on the first floor. Access to the control room for the control equipment is by means of lifting gear in the



*General view of the Low Road Substation to show control room (front) with switch-house behind and transformer site in background.*

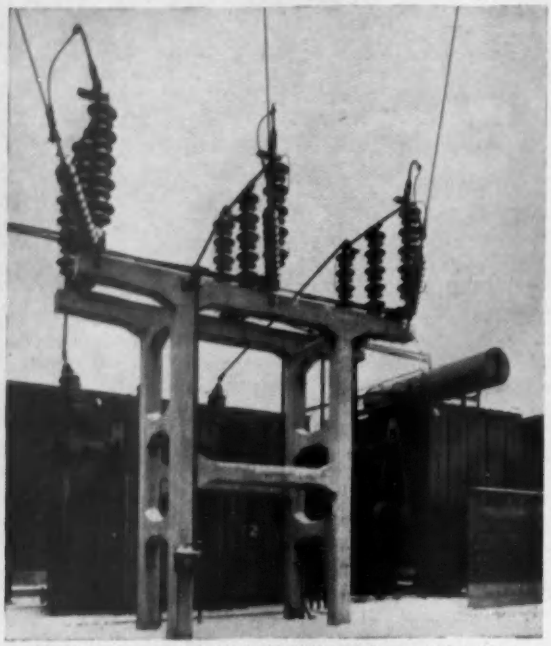
staircase well. The presence of water disclosed at some depth during the excavation work rendered it desirable to tank the cable basement in asphalt.

The outdoor transformer compound lies at the rear of the main building and comprises massive reinforced concrete rafts for the main transformers with suitable plinths for the neutral earthing transformers, liquid resistors and ancillary equipment. The compound is so constructed as to form oil drainage pits for each transformer, the pits being filled with pebbles. Trial bores and subsequent excavations proved the site to be a difficult one and due to the nature of the ground and the presence of old cellars it was necessary to drive 26 ft long piles to support the main transformer rafts. The 132 kV isolators are supported on reinforced concrete structures at the rear of the transformers. A small auxiliary plant house is constructed at the rear of the transformer compound to house the main 415 V a.c. auxiliary switchboard and the transformer oil-handling equipment.

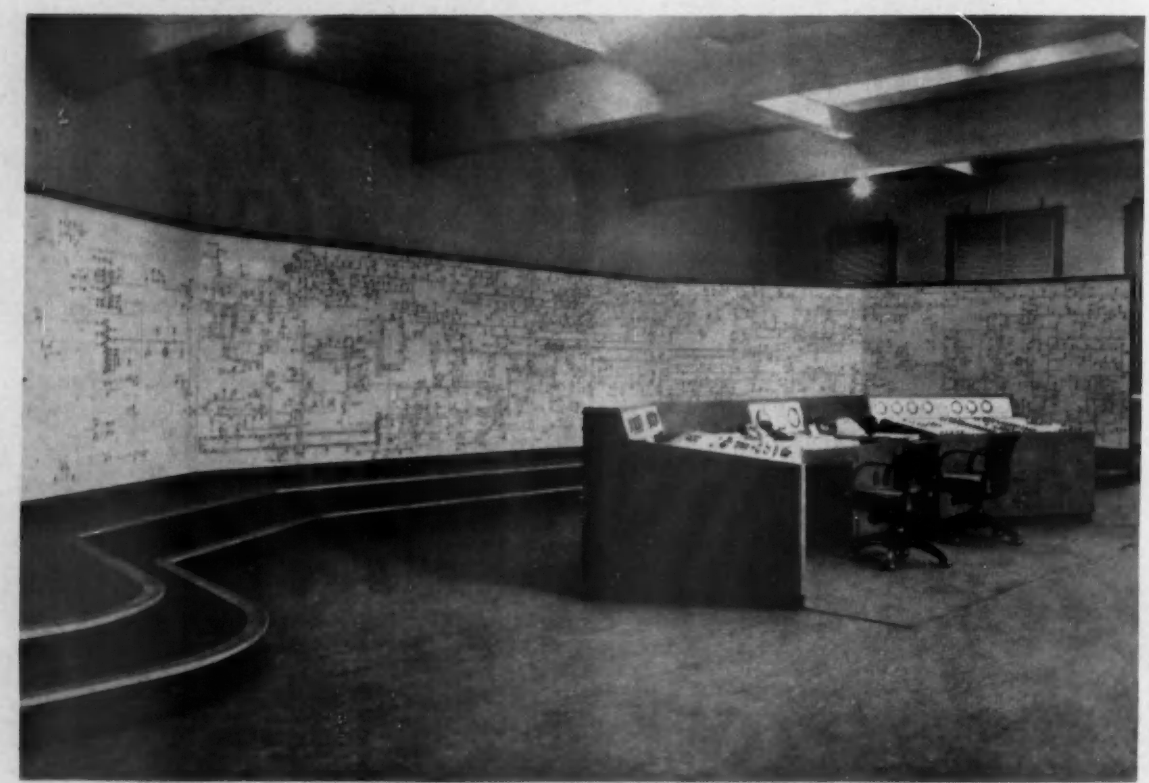
## *Incoming Supply*

The substation comprises duplicate transformer-feeders supplied at 132 kV from Skelton Grange Power Station over a distance of approximately 1¼ miles by means of a double-circuit overhead line terminating at Low Road on 132 kV isolators in the transformer compound, and at Skelton Grange on circuit bays in the 132 kV switching compound. The conductors are of 0·175 sq in. copper equivalent steel-cored aluminium as used on the 132 kV Grid system. The isolators are provided with interlocked earthing blades on both sides.

The main transformers, of Ferranti manufacture, are each rated at 100 MVA under conditions of OFB cooling and have a 50% rating with natural cooling. Each is a 3-phase unit in one tank having a nominal transformation ratio of 132/33 kV and connected star/delta to B.S. 32.Yd.1. At the time of their production they were the largest 3-phase units fitted with automatic on-load tap changing equipment to be built in this country and they provided several transport problems, including the lowering of the main road under a railway bridge at one point.



*132 kV isolators with, behind, 100 MVA transformer with radiator*

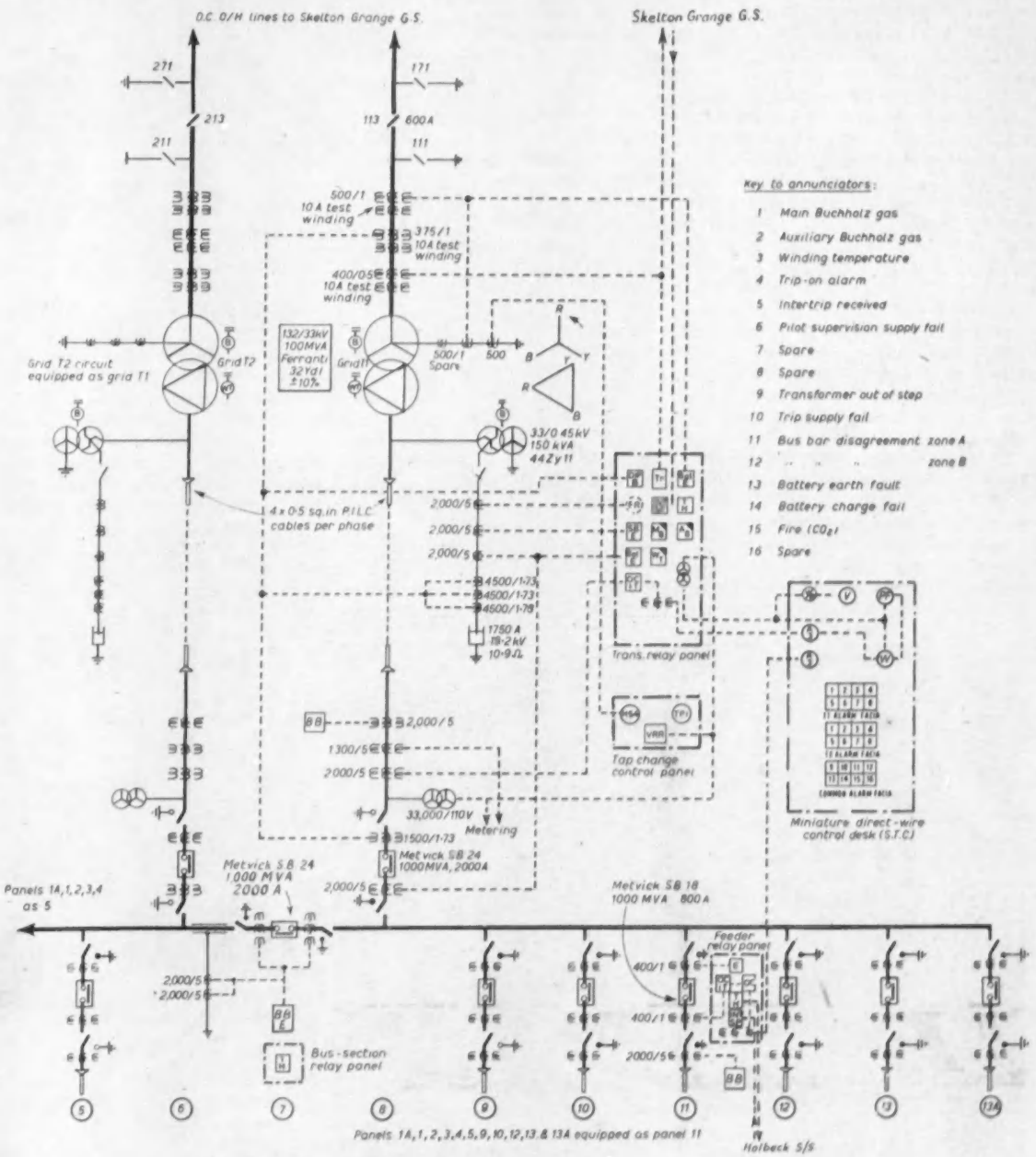


*Control room interior view with comprehensive mimic diagram, control desk and supervisory equipment. (Photo: William Mason and Sons Ltd.)*

As can be seen from the photograph each transformer is provided with twin cooler banks. Forced cooling is introduced by means of a forced-draught fan mounted under each cooler bank and by two submersible motor driven oil pumps. The Ferranti directed oil flow principle is used, in which the cooling oil entering the bottom of the tank is not discharged into the general volume of the oil but is lead directly to chambers forming the bottom end clamps. From these chambers the oil is delivered through passages to the axial ducts of each winding, these ducts being fitted with oil directing barriers which cause the oil also to flow to and fro across the winding through radial winding ducts. This positive flow through the radial ducts assists in reducing the temperature gradient between windings and oil and in maintaining uniformity of oil temperatures in the three windings. The forced cooling is automatically brought into operation by the closing of contacts on a winding temperature indicator, the fans and pumps being started simultaneously.

The on-load tap changing gear is fitted on the 132 kV side and is of the continuously rated mid-point reactor type. It is provided with fully automatic parallel control facilities on the master/follower principle. Either transformer may be made master at will with the other following automatically, or the units may be controlled individually.

With each transformer is provided an outdoor marshalling kiosk housing the tap changer ancillary equipment, the cooler motor control gear and the winding temperature




*Schematic diagram of main connections and protection arrangements of 132/33 kV substation*

indicators; the transformer multicore cables are also marshalled at this point.

The star point of the transformer 132 kV windings is solidly earthed. An interstar/star earthing and auxiliary transformer is solidly connected to the 33 kV windings of each main transformer, the star points of the interstar windings being earthed through liquid neutral earthing resistances rated at 1,750 A for 30 seconds.

The main transformers are provided with standard outdoor bushings on the 132 kV side and with cable boxes on the 33 kV side. The connections to the 33 kV transformer circuit-breakers comprise twelve single core 0·4 sq in. p.i.l.c. cables—four cables per phase—laid in cable tunnels constructed under the access road from the transformer compounds to the cable basement. The earthing and auxiliary transformers are also connected by 33 kV single core 0·3 sq in. cables to one of the duplicate cable boxes on the main transformers. It is interesting to note that it was necessary to construct a wood model of the cable basement to determine the ideal arrangement of the basement and transformer cables.

Three sets of current transformers are fitted in the transformer 132 kV bushing turrets for translay, duo-bias and balanced earth fault protection respectively. Outdoor type current transformers containing three cores and windings are provided in the 132 kV neutral earth connections. These are for balanced earth fault and high speed ammeter service, one being spare. Two sets of outdoor type current transformers are provided on the 33 kV neutral earthing connections containing cores and windings for fault duration indicator, stand-by earth fault, restricted earth fault and duo-bias duty respectively.

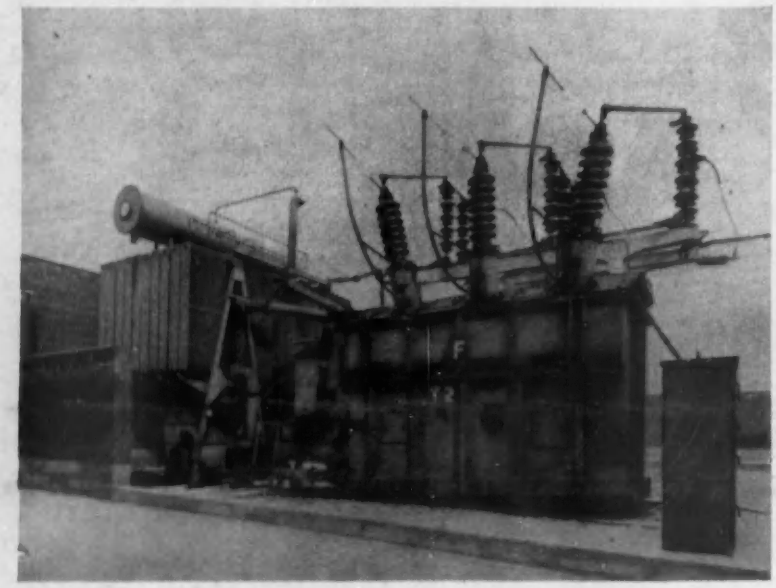
The single-line diagram shows the protective gear arrangement from which it will be seen that the 132 kV lines are covered by translay pilot protection and overlapping this is the transformer protection comprising Reyrolle due-bias differential, 132 kV balanced earth fault, 33 kV restricted earth fault, 33 kV stand-by earth fault and 33 kV back-up overcurrent protection. In addition, the main transformers are fitted with double-float Buchholz devices and winding temperature indicators having alarm and trip contacts; the earthing and auxiliary transformers are fitted with double-float Buchholz devices. The 132 kV circuit-breakers at Skelton Grange and the 33 kV transformer circuit-breakers at Low Road are intertripped by means of surge-proof intertripping relays.

The auxiliary windings of the earthing and auxiliary transformers are cabled to a 415 V industrial pattern combined switch-fuse board in the auxiliary plant house at the rear of the site, to provide duplicate 415 V a.c. supplies for the substation. The incoming and bus-section switches on this board are interlocked to prevent paralleling on the 415 V side of the earthing and auxiliary transformers. Two circuits on opposite sides of the bus-section switch feed an automatic changeover contactor which in turn supplies the 415 V a.c. services required in the main building over a 4-core cable. This arrangement provides for automatic restoration of the a.c. services in the main building should either of the incoming transformer-feeder circuits fail.

## *Switchgear*

The main 33 kV switchroom is designed to accommodate fifteen circuit-breakers comprising two incoming transformers a bus-section and twelve outgoing feeder circuits. The switchgear is Metropolitan-Vickers Type SB.18 and SB.24 single-busbar phase-segregated indoor metalclad equipment rated at 1,000 MVA 33 kV. The transformer and bus section units are Type SB.24 having a normal current rating of 2,000 A whilst the feeder units are Type SB.18 rated at 800 A. The bus-section circuit-breaker, which in this design of gear is set at right angles to the main busbar run to facilitate the busbar connections, is completely segregated from the two main sections by fire division walls. The initial installation comprised two transformers, a bus-section and six feeder equipments, four of which are feeding two of the 33/6·6 kV substations referred to earlier. The other two units will shortly feed a new 33/11 kV substation and a further six units are in course of erection, thus completing the installation at Low Road. These latter units are required in connection with further reinforcement schemes in the area.

The difference between the SB.18 and SB.24 units is mainly one of size but the 2,000 A, SB.24 unit is fitted with a twin contact arrangement specially designed for this contract. The circuit-breakers are of the single-break type and each three-phase breaker consists of three cylindrical tanks mounted on a common pedestal divided into three separate compartments by steel barriers providing complete phase separation. The busbars are of the condenser bushing type and the busbar selectors, cable insolators and cable boxes are also completely phase separated. A single solenoid operating mechanism drives all three poles through mechanical couplings. Local control and local/remote control selector switches are provided on the escutcheon for maintenance operation. A mechanically driven mimic diagram showing circuit-breaker, bus selector and cable isolator positions is also incorporated on each circuit-breaker escutcheon. The bus selectors and cable isolators are three-position devices "ON," "OFF" and "EARTH" and are fully interlocked mechanically with the circuit-breaker to prevent incorrect operation. Access to the arc control devices and main contacts on the circuit-breakers is by means of mechanically interlocked doors on



*Ferranti 100 MVA transformer showing 132 kV bushings, radiators, fans and pumps*

*Some of the relay panels in the relay room. Note the trunking and cable marshalling cabinets*

the front of each phase tank. A built-in oil handling system comprising bus pipes and clean and dirty oil tanks facilitates oil maintenance. All the main cables pass through holes in the switchroom floor into the cable basement which is divided into two sections for fire division purposes. The multicore control cables are likewise separated into the two halves of the cable basement.

The switchgear is protected by a three-zone busbar protection scheme using the current balance, frame check principle. For this purpose it is lightly insulated from the building fabric. The 33 kV outgoing feeder circuits, which are of the transformer-feeder type, are provided with balanced earth fault, high-set instantaneous overcurrent and back-up overcurrent protection. Surge-proof intertripping is also incorporated.

The relay panels and metering equipment are contained in a relay room on the ground floor running parallel to the main switchroom. The transformer and feeder panels are of the semi-corridor cubicle type, the bus-zone protective gear being mounted on separate cubicles. The Authority's charge metering equipment is also mounted on separate cubicles. At one end of the relay room is an auxiliary plant room housing the 415 V substation distribution combined switch-fuse board, the main battery charger and 110 V d.c. control board and the $CO_2$ fire protection installation.

To the front of the relay room lie the battery and supervisory apparatus rooms. The battery room houses the 110 V, 400 Ah capacity main operating battery consisting of 55 open type cells and a 50 V, 75 Ah capacity supervisory battery of 24 sealed type cells. The former battery provides 110 V d.c. for circuit-breaker operation and emergency lighting. The supervisory apparatus room houses the apparatus cubicles both for the local direct-wire and remote supervisory control desks together with the 50 V d.c. distribution board and charger.

The 33 kV switchrooms are protected by an automatic $CO_2$ fire fighting installation consisting of a bank of cylinders for the bus-section chamber and another, and much larger, bank the discharge from which is automatically directed into either of the two main switchrooms. Both these banks are discharged by the melting of fusible detector links. A stand-by bank of cylinders which can be discharged manually into any of the three rooms is also provided.

## *Control Room*

As mentioned earlier one of the departures from the original scheme for Low Road substation introduced by the Yorkshire Electricity Board was the addition of the system control room. This control room is one of several being constructed, with one exception, at Grid supply point substations for the operational control of the Board's high voltage systems. The control centre at Low Road is the first of these to come into operational use and from it is exercised the direct control of the 6·6 kV, 11 kV, 33 kV and 66 kV networks in an area of approximately 800 square miles which includes the No. 4 (Leeds) Sub-Area and extends eastwards to the river Trent. The load in this area is approximately 300 MW and the operation of some 2,000 substations and pole equipments is controlled.

The control room is 50 ft long and 32 ft wide and occupies most of the first floor of the substation building. Its most prominent feature is the system diagram board which has an area of 40 sq ft and extends for the full length of the control room. It is constructed of eau-de-nil vitrolite glass panels supported in a wood structure, the diagram of the system being displayed by means of transfers. Small studs stuck to the glass are used for representing circuit-breaker and isolator positions and serve to carry coloured washers for indicating the state of the system. This construction was adopted after a considerable amount of careful thought and the Yorkshire Electricity Board consider it to be the most flexible arrangement for a hand-dressed diagram since modifications to the diagram can easily be made by replacing the transfers without causing permanent disfigurement of the background.

The main control desk is located in the centre of the room facing the system diagram board. The desk has a centre 2-operator writing position and two wings. The

*Three of the Metrovick SB18 feeder switches, with one of the SB24 switches in the substation*

remote control gear for Low Road substation is mounted on the left-hand wing while that on the right hand contains the supervisory remote substation control and indication facilities.

## *Low Road Substation Control*

The control of the switchgear and transformers at Low Road is carried out from the left hand wing of the desk by means of direct-wire equipment of the telephone type. The face of the desk comprises a pivotted steel panel on which discrepancy type control keys are mounted in a mimic diagram. All the alarms such as Buchholz, winding temperature, fire etc., are displayed on annunciators mounted on the rear facia panel of the desk. Permanently connected instruments also mounted on this facia panel continuously display the loading conditions on the 100 MVA transformers and two sets of instruments, one for each section of the busbar, can be selected by means of keys on to any feeder in the appropriate section. Provision is made for control selection of the transformer tap changing equipment from automatic master/follower to individual remote hand operation, tap change raise and lower control keys being fitted. The transformers are provided with a tapping range of plus and minus 10% in fourteen steps of 1·43% and tap position indicators on the desk continuously display the tappings on which the transformers are running. The transformers normally operate on fully automatic control which is effected by means of voltage sensitive relays adjusted to maintain a constant busbar voltage of approximately 33 kV. Voltage variations on the distribution system are catered for by means of automatic voltage control equipment on the 20 MVA transformers at the satellite substations. Alarm annunciations and automatic changes in circuit-breaker positions are given by flashing lights and audible warnings which have to be accepted by operation of the appropriate keys.

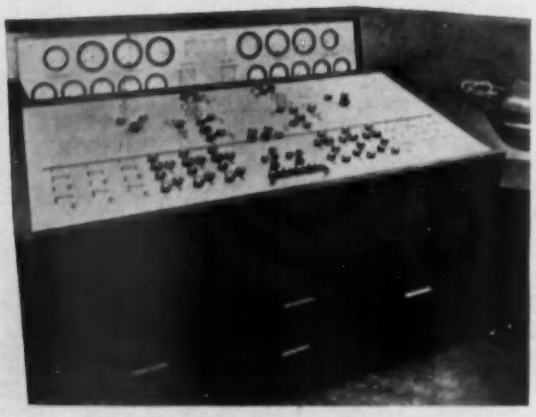
## *Supervisory Control Equipment*

The supervisory control equipment is mounted on a pivotted steel panel forming the face of the right hand wing of the desk and is designed to provide the control engineer with complete control and indication of the satellite substations. The facilities provided include circuit-breaker close and trip control, circuit-breaker position and transformer tap position indication, transformer and feeder current and voltage indication, together with signalling of all alarm conditions.

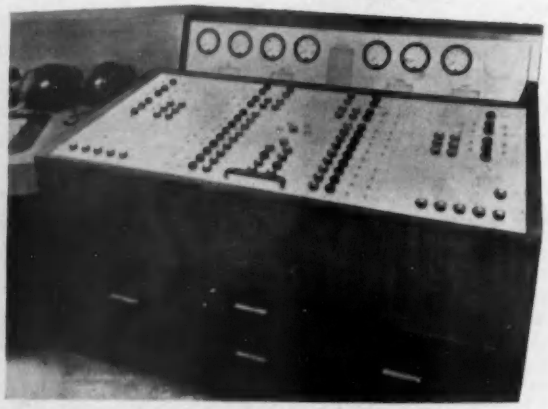
The equipment uses the common diagram principle which arrangement was selected on the grounds of economy in space, economy in capital cost for the number of substations envisaged and ease of extension without interfering with control room duties. The diagram is designed to cater for the substation requiring the maximum number of controls, indications and alarms and the remaining substations requiring fewer facilities can be presented on the diagram. The largest substation contains a large duplicate-busbar switchboard fed by four transformers and it was considered that this arrangement would not be exceeded since new substations are designed on the basis of single-busbar switchgear and at the most triplicate transformers. Circuit-breakers and isolators are indicated on the diagram panel by means of three-colour single-aspect control keys, only those equipments equipped at a given substation being displayed. The colours are red for "CLOSED," green for "OPEN" and white for "ISOLATED" or "EARTHED" depending on the type of equipment being indicated. The connection of the diagram to a particular substation is initiated by the control engineer or alternatively by a call received as a result of a change of condition at the substation. Connection of the diagram causes all the indications at the substation to be checked down and presented on the diagram. Current and voltage indications for individual transformers and feeders can then be displayed on request. Since the diagram is never permanently connected to any substation a series of schematic diagram cards is provided for relating the diagram display to the actual circuit arrangement of each substation.

The remote substations are connected by means of pilot wires to the control station and as the number of pilot circuits available is limited, tandem switching has been introduced. Initially, there is one such tandem switching equipment at Kirkstall Power Station but the equipment at Low Road is designed on the basis of dummy tandems in order to achieve complete uniformity throughout the system. Each satellite substation is connected to the tandem station by two pairs of pilot cores and there are three pairs of pilot cores between a tandem station and the control station at Low Road.

Signalling is carried out by pulses of positive or negative polarity at a frequency of approximately 8-10 pulses per second using the constant total code system. Substations are connected to the control station by the sending of a suitable substation, or control station, code which initiates the selection of the appropriate pilot pairs from substation to tandem station and tandem station to control station or from substation direct to control station as the case may be. Pilot circuits so seized are retained until signalling is completed.



*Left wing of control desk to show main substation remote control equipment*



*Right wing of desk to illustrate remote operation and control equipment for external substations*

Each satellite substation in the supervisory scheme is identified on the desk by means of an individual station selection key which serves to enable the control engineer to select any station at will and also identify a station calling the desk due to a change of condition. Alarms are indicated by flashing lights in annunciator facias and circuit-breaker position changes cause the appropriate circuit-breaker control key to flash, the steady condition being achieved by accepting the signal.

The relay apparatus associated with the supervisory equipment is contained in sheet-steel cubicles located in the supervisory apparatus room immediately underneath the control room. The connections between the apparatus cubicles and the control desk are made by means of telephone-type lead-covered cables. At each satellite substation there are two cubicles, one for marshalling the multicore cable connections and the other containing the telephone type apparatus. Suitable link disconnecting facilities are provided between the supervisory apparatus and the initiating contacts on the switchgear, transformers and other equipment. Each substation is equipped with a 50 V battery and automatic charger.

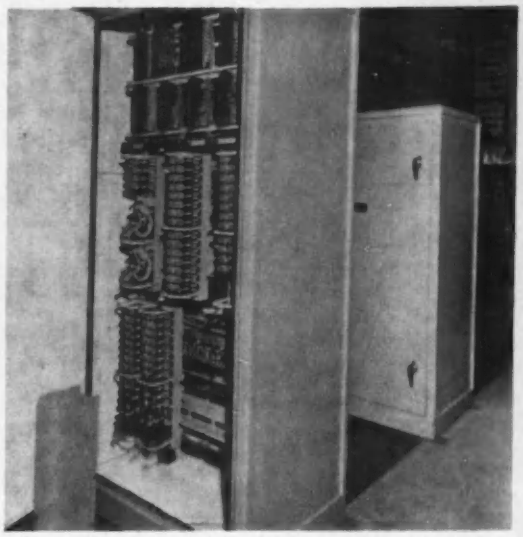
This type of supervisory installation can be designed for the control of any number of substations and at Low Road initial provision is made for the control and indication of up to 50 substations.

## *Operation*

As an example of procedure, if the control engineer wishes to trip a circuit-breaker he turns the selection key for the substation concerned. This action sets up the substation code, connects the desk to the substation via the appropriate pilot circuits and initiates a check down of all the indications at that substation which are then displayed on the desk. He then selects the circuit-breaker to be opened by turning the circuit-breaker control key which causes that key to flicker and the "trip" and "close" keys to be illuminated. Operation of the "trip" key causes the tripping code to be transmitted with consequent operation of the tripping interposing relay associated with the circuit-breaker. The change of position of the circuit-breaker sends back an indication code which causes the circuit-breaker control key to flash the new colour in this example, green. The green is then steadied by turning the circuit-breaker control key to the new position. In a similar manner operation of the appropriate meter keys connects the instruments on the desk directly to the auxiliary current or voltage transformers on the circuit-breaker selected. Sequential meter indications are used, i.e. only one indication can be displayed at a time. If all the meter keys are selected then the readings are automatically displayed sequentially as the keys are restored to their neutral positions one by one, the pilot cores remaining seized until all the keys have been restored.

An automatic change of condition at a substation causes the appropriate substation selection key to flash and a bell to ring. The operator silences the bell by means of an acknowledge key and connects the substation to the desk by turning the substation key when the indications are automatically displayed on the desk in a manner similar to that described above, except that the lamp in the key or annunciator associated with the device which initiated the control station call is flashed. The steady condition is achieved by aligning the circuit-breaker key or by acknowledging the alarm annunciation.

Our thanks are due to the Yorkshire Electricity Board, the Yorkshire Division of the Central Electricity Authority, Metropolitan-Vickers Electrical Co., Ltd., Ferranti Ltd., and Standard Telephones and Cables Ltd. for their co-operation and help in preparing this article.



*One of the remote substation supervisory equipment cubicles showing telephone type relays*

MAIN CONTRACTORS

| | |
|---|---|
| 33 kV Switchgear | Metropolitan-Vickers Electrical Co., Ltd. |
| 132 kV Isolators | British Thomson-Houston Co., Ltd. |
| Transformers | Ferranti Ltd. |
| 50 V and 110 V Batteries | The Tudor Accumulator Co., Ltd. |
| Supervisory and Direct-Wire Control Equipment | Standard Telephones and Cables Ltd. |
| 33 kV Cables | Enfield Cables Ltd. |
| 132 kV Overhead Line | Watsham's Ltd. |
| Fire Fighting Installation | The Pyrene Co., Ltd. |
| System Diagram Board | William Mason & Son Ltd. |
| Buildings | Samuel Flockton Ltd. |
| Civil Engineering Works | Concrete Design Ltd. |

# The Geophysical Year 1957-58

IN 1882-3, the nations of the world held an International Polar Year in which meteorological and geomagnetic observations were made at a number of stations grouped with a few exceptions, in the North Polar Regions. Fifty years later, in 1932-3, a second International Polar Year was arranged which included ionospheric observations.

It was considered that a repetition of the Polar Year would be much less valuable than a more widely distributed International Geophysical Year in which observations in all branches of geophysics should be made at stations fairly widely distributed over the whole world with special attention to certain regions. This international effort will extend from July 1957 to December 1958 and over 30 nations will co-operate. The features to be studied will be meteorology, including normal surface observations as well as temperature, wind and humidity in the upper atmosphere, measurement of ozone, solar and atmospheric radiation.

Electrical phenomena to be investigated include geomagnetism, aurora and airglow, cosmic rays and ionospheric characteristics. The observations will be concentrated over the Antarctic, the Equator and the Arctic and three north to south zones, one passing through Europe and Africa, another through the continent of America and a third through the U.S.S.R., Japan, and Australia.

The outstanding entirely new United Kingdom project is to establish a station in the neighbourhood of Vahsel Bay at the head of the Weddell Sea. This site is within the zone of maximum auroral frequency and near enough to the South Magnetic Pole to give results of interest as regards variations of the magnetic field.

# Commonwealth Nuclear Energy

## *WORK NOW BEING UNDERTAKEN IN RESEARCH AND MATERIAL RESOURCES*

THE part being played by the Commonwealth in the development of nuclear projects is described in a small booklet recently issued by the Central Office of Information and published by Her Majesty's Stationery Office, price 2s. This begins by recounting the early work carried out in the investigation of the atom and its potentialities and then gives a brief general history of general development to the present day.

In the Commonwealth, Canada was early in the field of research. It was at McGill University, fifty years ago that Rutherford and Soddy first announced the theory of atomic transmutation, and suggested that the atom contained vast amounts of energy. In 1940 Canada joined in an exchange of information with the U.K. and the U.S.A. on atomic energy and in 1942 a joint Canadian-United Kingdom laboratory was established for further study of the problem. The following year, design of the NRX pile was developed in the Montreal laboratories, and by 1944 construction of the plant was begun at Chalk River, Ontario. In 1946 with the setting up of the United Kingdom Atomic Energy Research Establishment at Harwell the joint partnership with the United Kingdom ceased and the National Research Council assumed sole responsibility for Chalk River. The accent changed from war to peace and feasibility studies were initiated in co-operation with Ontario Hydro on an atomic energy power plant. A second reactor, NRU, was proposed in 1951, and in 1952 a new Crown Company was established. On 7th January, 1953, it was announced that construction had started on the NRU heavy water reactor at Chalk River.

Canada has a number of uranium mines and supplies uranium oxide to America for conversion into uranium metal. Work is progressing rapidly in the power field and a power reactor for 20 MW is being constructed by Canadian General Electric for a power station to be built jointly by the Federal Government and Ontario Hydro. Completion is expected in mid-1958. Preliminary studies are in hand for a large power reactor capable of producing in the neighbourhood of 100 MW.

### *Australia*

Responsibility for nuclear energy in Australia rests with the Atomic Energy Commission. Work up to the present has been mainly concerned with the development of supplies of uranium from Rum Jungle near Darwin and in conjunction with the South Australian Government from Radium Hill and other sources. A detailed survey is to be carried out by airborne means and will eventually cover most of the Northern Territory with excursions into likely areas in the neighbouring states. Substantial shipments of uranium oxide have left Darwin for delivery to the United Kingdom, United States and Canada.

In October, 1954, the Australian Minister of Supply announced a 5-year nuclear research programme costing more than £A.5m., and approval had already been given to the construction by the Commission of a power reactor of an advanced type capable of acting both as a research tool and as a contribution to the development of atomic power. The U.K. Government had agreed to supply Australia with information about recent developments and would also afford facilities to Australian scientists to obtain first hand knowledge of the design and operation of nuclear reactors. As is well known, Australia took a considerable part in the first British atomic weapon tests.

### *New Zealand*

The main contribution to nuclear energy from New Zealand is likely to be the provision of heavy water from the geothermal steam project at Wairakei, North Island. A company, Geothermal Development Ltd., has been incorporated in New Zealand to undertake the construction of the factory for heavy water and power production. This company will be financed by the U.K. Atomic Energy Authority and the New Zealand Government, and the construction of the factory will be undertaken by the New Zealand Ministry of Works. It is envisaged that production of heavy water will begin in 1957 and electric power will follow shortly. The A.E.A. will purchase the total output of heavy water, and the New Zealand State Hydro-Electric Department the whole of the net electric power available.

### *South Africa*

An Atomic Energy Board was set up in South Africa in 1949 to exercise general control over atomic energy work and in particular to promote prospecting for uranium and the mining and refining of ores. In 1950 a £50m. scheme was inaugurated for installing the necessary plant to produce uranium concentrates as a by-product of gold mining. So far 23 gold mines have been admitted to the scheme and seven are already extracting uranium. Exports of thorium and uranium oxide are rising in quantity and value, averaging about £1·1m. per month in the first eight months of 1954.

### *India*

India is working on a development plan involving the building of a uranium processing plant and the setting up of a medium sized reactor. The main feature, however, is the discovery of extensive uranium deposits and the presence of the largest thorium deposits in the world. India's economic plans are therefore based on uranium in the beginning but later will be based entirely on thorium. Plant for the extraction of rare earths is already in operation at Alwaye in Travancore-Cochin while a second plant for the extraction of thorium and uranium came into operation at Trombay, near Bombay, in May of this year. A fertilizer plant, producing heavy water as a by-product is to be set up in the Bhakra-Nangal area.

### *Other Commonwealth Countries*

Pakistan has established an Institute of Atomic Energy and schemes of development and survey are being prepared. In Southern Rhodesia, traces of uranium have been found ten miles from Salisbury and a prolific source of low grade ore lies in the ancient Matapos granites. Workable uranium deposits have been found in Northern Rhodesia but no information has yet been released of their quantity or quality. Low grade ore is also available in some of the Nigerian granites.

The booklet ends by giving an account of the development of international co-operation and includes the Soviet proposals for an International Atomic Energy Agency, and the U.N. Draft Resolution on Co-operation in Developing Peaceful Use of Atomic Energy.

# A Seal for High-Pressure Measurement

## U.S. DEVELOPMENT USES SAPPHIRE INSULATING BUSHING

IN connection with work on high-pressure standards, the U.S. National Bureau of Standards has recently devised a special insulating seal which effectively solves the problem of leakage around electrical connections to high-pressure vessels. Simply constructed of inexpensive materials, the high-pressure seal utilises a sapphire bushing to obtain the necessary combination of high mechanical strength and good electrical insulating properties. The device has successfully withstood pressure up to 170,000 pounds per square inch. It was designed by H. A. Bowman and associates of the Bureau staff working under the sponsorship of the U.S. Army Ordnance Corps.

Methods of measuring and controlling high pressures are becoming increasingly important to science and industry. For example, in the chemical industry, pilot-plant operations are now being run at pressures as high as 100,000 lb/sq in. and laboratory operations are moving into the range from 100,000 to 200,000 lb/sq in. Also, in ordnance, both laboratory studies and large-scale operations are making use of very high pressures. As pressures increase problems of equipment design become increasingly difficult. Not the least of these has been the problem of making electrical connections to the interior of a high-pressure vessel without leakage. Though developed specifically for use in calibrating high-pressure standards, the new high-pressure seal may prove useful in chemical, metallurgical, petroleum refining, and other industrial equipment where high-pressure operations are monitored or controlled electrically.

### *Seal Requirements*

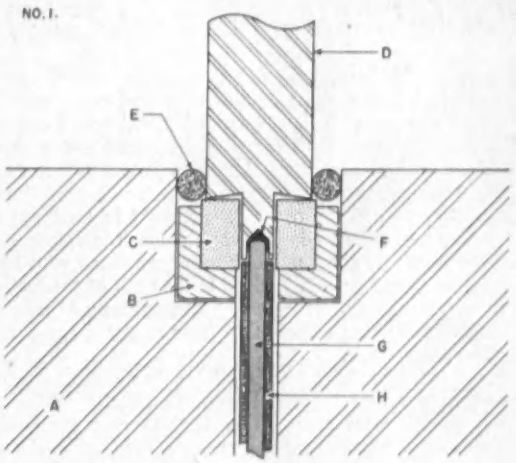
Above 50,000 lb/sq in., hydrostatic pressures are commonly measured by inserting a previously calibrated resistance coil in the pressure vessel and noting the change in resistance as pressure is applied. In commercial equipment, one end of the pressure-sensitive resistance coil is usually attached to a high-pressure steel closure plug inserted in a hole in the pressure vessel. The other end of the coil is attached to an electrode which is inserted in the central opening of the closure plug but which is insulated from the plug by a bushing of some kind. External connections can then be made to the insulated electrode and the exposed portion of the steel closure plug. To minimise the problem of changes in lead resistance, a 4-lead system is usually employed for precision measurements.

In order to utilise commercial equipment in so far as possible, the Bureau's insulating seal was designed so that the space occupied by a 4-lead connection would be the same as that required for commercially available single-wire fitting of the same shape. It was also decided that the resistance of the insulating bushing should be not less than 1,000 megohms within the pressure range under consideration.

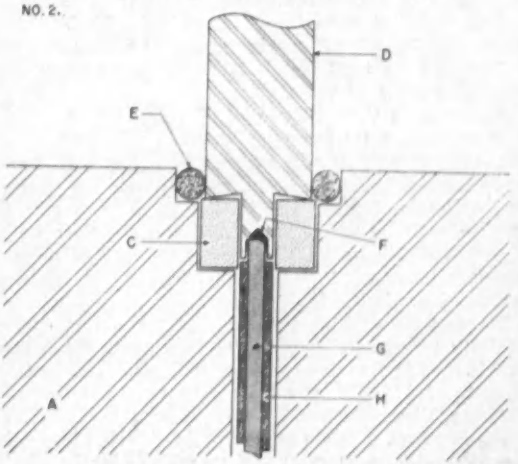
### *Design of Seal*

The new seal is composed of a soft steel electrode, a sapphire or quartz insulating bushing, a rubber "O" ring, and a soft steel pad, assembled and set into a cavity in the closure plug. The soft steel pad fits directly into the plug cavity and supports the insulating bushing. Through the hole in the bushing passes the electrode, to which is soldered one end of the pressure measuring coil. The portion of the electrode external to the bushing is larger in diameter than the internal part and presents a tapered surface to the external face of the bushing. As a result of the taper, only the outer rim of this surface makes contact with the bushing unless very high pressure is applied. The rubber "O" ring separates the larger-diameter portion of the electrode from the wall of the cavity in the closure plug.

In operation the seal acts in two phases. The "O" ring provides the initial low-pressure seal through its compression contact with the electrode and the interior wall of the cavity in which the assembly is installed. This seal probably lasts up to about 30,000 lb/sq in. Then, at about the




*No. 1. Cross section of high-pressure insulating seal recently developed by the U.S. National Bureau of Standards. A, closure plug body; B, soft steel pad; C, insulating bushing; D, soft steel electrode; E, rubber "O" ring; F, soft solder joint; G, copper wire from pressure measuring coil; H, spaghetti insulation. Combining high mechanical strength with good electrical insulating properties, the new seal withstands pressures up to 170,000 lb/sq. in.*




*No. 2. Cross section of the simplified version of the U.S. National Bureau of Standards new high-pressure seal. Use of a softer insulating bushing permits elimination of the soft steel pad of No. 1*

pressure that the "O" ring becomes ineffective, the tapered section of the electrode is deformed against the bushing, thereby sealing off the leakage path between the bushing and the electrode. Simultaneously, or shortly thereafter, the soft steel pad is deformed by pressure, sealing off the leakage path between the bushing and the wall of the plug cavity.

Commercially available sapphire instrument bearings have proved quite satisfactory as insulating bushings. Besides having the required physical characteristics, they are inexpensive and can be obtained already ground to extremely exacting tolerances. It has been found that when the basal plane of the crystal becomes tangent to the planes of shear force in the loaded bushing, the crystal slips along this plane, probably because of twinning. However, this slippage does not interfere with the operation of the seal since the steel pad is again deformed against the interior surface of the bushing after slippage. Selection of bushings with the proper crystal orientation is expected to reduce the possibility of slippage. Fused quartz is less brittle than sapphire and is almost as good as an insulator.

The high-pressure seal can be simplified considerably by choosing softer bushings that do not require the soft steel pad. With this type of seal, bushings of lithographic limestone have been used successfully. However, great care must be given to the election of the limestone since this stone has many flaws which may cause the bushings to crumble under load. Once a flawless piece has been selected, it is easily turned on the lathe using sharp tools, preferably carbide, and taking small cuts.

REFERENCE

"The Physics of High Pressure," by P. W. Bridgman, pp. 51-56. (G. Bell and Sons Ltd., London, 1949)

# Australia Economic Survey

## *Electrical Aspects of Production and Development Outlined in B.o.T. Publication*

RECENTLY issued by Board of Trade is an Overseas Economic Survey of conditions in the Commonwealth of Australia. This covers, as is usual with the series of Economic Surveys, all facets of industrial and agricultural production, and a small section is devoted to electricity and appliance production.

The survey shows a rapid development in all types of secondary and primary industry, although it is emphasised that the relatively short working week combined with high wage rates have necessarily added to the costs of production in manufacturing industries which consequently experience difficulty in meeting competition from overseas sources or in the export trade.

Power supplies have been and are being developed to keep pace with the industrial expansion, and shortages of power, which were common in 1952-53 have now been overcome and major expansion projects, both hydro-electric and thermal, are being undertaken with a view to ensuring that Australia's industrial progress is not restricted by lack of power supply. In the hydro field, many hydro-electric projects are associated with irrigation schemes to allow for improvement in agricultural productivity.

The most important of the hydro schemes is that being undertaken in Snowy Mountains, which is scheduled for a final installed capacity of some 3,000 MW. Annual expenditure on this scheme is running at a level of about £A14m and the total cost is estimated at £A422m to be spent over some 25 years.

At Kiewa, in Victoria, a series of hydro-stations is being built to have a total installed capacity of 289 MW, but although the work is now progressing it has been slowed down due to financial restrictions. The Eildon reservoir on the Goulburn River, also in Victoria, is being enlarged mainly for irrigation purposes and a new power station of 120 MW will be built. Many other smaller projects, both for improved irrigation supplies and for electricity generation are in hand.

Thermal power still accounts for the major part of Australia's electricity supply. The New South Wales black coal is used in Bunnerong power station with its installed capacity of 375 MW, and the second largest station is at Yallourn, Victoria, with 225 MW. This station is fed from the brown coal open cut mines in Gippsland. Many other thermal stations exist, most of them utilising local coal.

Lighter engineering industries engaged in the manufacture of electrical consumer goods are well established and

TABLE 1. ELECTRIC MOTOR PRODUCTION

| | 1952–3 | 1953–4 |
|---|---|---|
| Under 1 h.p. ... ... ... ... | 566,855 | 934,717 |
| 1 h.p. and under 2·5 h.p. ... ... | 15,502 | 22,891 |
| 2·5 h.p. ,, ,, 5 ,, ... ... | 7,983 | 9,615 |
| 5 h.p. ,, ,, 10 ,, ... ... | 4,897 | 5,358 |
| 10 h.p. ,, ,, 50 ,, ... ... | 5,637 | 4,700 |
| 50 h.p. and over ... ... ... | 785 | 565 |

TABLE 2. PRODUCTION OF DOMESTIC APPLIANCES

| Type of Appliance | 1952–3 | 1953–4 |
|---|---|---|
| | (thousands) | (thousands) |
| Washing Machines ... ... ... | 92·6 | 145·8 |
| Refrigerators ... ... ... ... | 182·1 | 276·8 |
| Vacuum Cleaners ... ... ... | 38·4 | 57·3 |
| Radios and Radiograms ... ... | 297·2 | 433·7 |
| Hand Irons ... ... ... ... | 179·8 | 227·0 |
| Fans ... ... ... ... ... | 39·3 | 42·2 |
| Toasters ... ... ... ... | 117·8 | 148·5 |
| Hot Water Jugs ... ... ... | 110·0 | 149·9 |
| Food Mixers ... ... ... ... | 125·4 | 173·6 |
| Radiators and Fires ... ... ... | 72·1 | 146·2 |
| Bath Heaters ... ... ... ... | 17·4 | 15·9 |
| Kettles ... ... ... ... | 25·0 | 30·5 |
| Cooking Stoves ... ... ... | 63·0 | 80·0 |

equipped to cater for the demand and are protected by duties imposed on imported appliances. In the cable field, most types of cable can now be manufactured, although imports of special types of power cables are substantial and compete strongly with the local products.

### *Electrical Machinery*

The Australian manufacture of electrical machinery, cables and apparatus is well established. There are now 1,000 firms within the industry, total manpower being about 32,000 and in 1952-53 the total value of production was £A38·6m. Electric transformers and control gear are being manufactured by about 15 major firms and their output fills a substantial proportion of the Australian requirements for transformers for industrial and mining usage. Heavy duty equipment used in generation and transmission is still mostly imported. Production of electric motors, particularly in the smaller sizes has shown a substantial increase, but imports of these machines still run at a high level. The report is obtainable from H.M.S.O. price 7s. 6d. (by post 8s. 2d.).

# notes on wiring

by Megohm

SCHOOLDAYS, we were told, were the happiest days of our lives and, on reflection, I would agree with that statement. However, much has been done, and is being done to make the present scholar even happier, and the electrical industry is well to the fore in this effort. The lighting of my school left much to be desired and there are many engineers whose memories can take them back even further than mine can when, I feel sure, the introduction of electric lighting into the classroom was something of an event. Today the most critical persons are the pupils themselves and I have heard some extremely constructive remarks passed on the electrical installation by them.

## School Installations

One of the main objects in electrical installations in schools is the provision of adequate lighting, by lighting fittings which are pleasing to the eye. This has been thoroughly gone into by the fittings manufacturers and, indeed, certain fittings have become standard with education authorities. Care has been taken to produce fittings and glassware which give glarefree lighting coupled with easy maintenance. A bright classroom not only makes for mental alertness but conveys an air of cheerfulness and cleanliness which every schoolchild should be able to enjoy. Results of tests with different degrees of lighting indicate that the speed of perception of detail similar to symbols used in mathematical text books increases as the illumination is raised up to 50 lm/sq ft. Good illumination also assists in preventing eye-strain, and when one fumbles for one's glasses now one must surely appreciate the need to assist the child in early life by avoiding bad lighting. It is quite recently that I heard of a school where the illumination was down to 5 lm/sq ft. This was due to bad fittings and positioning of fittings. The matter has now been rectified and already certain of the teachers have expressed their relief at not having to grope around, and being able to carry out visual teaching rather than resorting to games.

I feel that in many instances the lighting in cloakrooms is not sufficient. I know that it has been decided at a higher level that 7 lm/sq ft is sufficient, but when I see the danger which exists in the projecting metal coat hooks and the inevitable horse-play in these areas, I feel that higher illumination is necessary. The same applies to corridors where danger exists in the shape of doors which swing through 180 degrees and metal heating radiators which always appear to be at the right height to inflict injury to a child's face. Of course, it may well be that these are matters which worried me during my school days.

## Services

Socket outlets are required in almost every classroom and these should be capable of carrying a load of not less than 1,000 W. These are mainly used for film-strip projectors and similar apparatus, but are very often in constant use for the supply of heat to fish tanks. Assembly Halls are usually equipped for film projection work and consideration should be given to the wiring between the projection room and the stage. It is possible that stage lighting will be required and again the manufacturers are always willing to produce a reasonably priced control board to suit the size of the stage.

Broadcasting now plays a large part in education, and special programmes are regularly broadcast by the B.B.C. Classrooms and assembly halls should be wired for broadcast reception and certain firms specialise in this work. Equipment similar to that used in hospitals is suitable, except that loudspeakers are employed throughout and headphones used only where there are partially deaf children. The choice of alternative programmes should be available, and I imagine that modifications will soon become necessary in certain schools to receive television broadcasts.

## Accessories and Switchgear

Children are naturally inquisitive and very often are inclined to be destructive. These factors must be borne in mind when the choice of accessories is made. Switches and switchsockets, etc, are liable to be interfered with and the safety of children must be kept well in mind when planning the installation. I would like to see every local authority set up a sample room containing samples of the standard required. One large authority has already done this with much success.

Switchgear should be mounted on a frame in a suitable position and kept as simple as possible. It should be remembered that the caretaker is usually called in to repair fuses, etc., and he is unlikely to be fully conversant with electrical equipment. Circuit lists should be clear and easily understood with the various points and rooms clearly detailed. Spare fuses should be available and a supply of fusewire at hand. Controlling switches should have clear labels affixed in order to assist the person responsible for maintenance.

Most wiring systems are suitable for schools and it is hardly necessary for me to deal with them here. During the period immediately after hostilities ceased, t.r.s. cables were used extensively in the rewiring of schools and the erection of the light construction type which replaced schools destroyed by enemy action. Care must be taken when using t.r.s. cables to prevent "sagging" and in certain cases it is specified that where these cables are brought into fuseboards a length of trunking should be installed at this position. The top of the fuseboard should be slotted and bushed with an insulating material. I cannot truthfully say that I agree with this arrangement. It looks most unsightly and, personally, I would be much happier to see all schools wired in conduit or m.i.c.c. cables. I feel that a neat workmanlike job might well leave a good impression on a child and encourage him or her to do likewise with the tasks given to them.

# The Bearspaw Hydro-Electric Development

RECENTLY COMPLETED PROJECT PROVIDES 18 MVA POWER OUTPUT

By DAVID R. DUGUID, B.Sc.

THE recently completed Bearspaw Project is situated about thirteen miles west of Calgary on the Bow River. It is a low head river type of development with a relatively small reservoir which provides only day-to-day storage. A head of 48 feet is provided by an earth fill dam 870 feet long, with a concrete spillway structure and power house at its south end.

The plant has a rated capacity of 20,750 h.p., provided by a single vertical Kaplan variable-pitch-propeller turbine coupled to an 18,000 kVA Westinghouse generator. The machine is of the low speed type, rotating at 128 r.p.m., and the turbine, of Swedish manufacture, provides automatic propeller pitch variation with load, thus ensuring maximum efficiency at all gate openings.

The intake structure, which is an integral part of the power house, is provided with two electrically operated headgates. Two draft tube gates are also provided to allow unwatering of the turbine for repairs and inspection. Three main gates are included in the spillway structure and these can pass a total of up to 100,000 cusecs. The structure also includes a small control gate to allow regulation of the reservoir and river flow. This gate can pass up to 4,000 cusecs and is heated to allow ice-free operation at all times. All of the gates are electrically operated and controlled directly from the plant. The concrete spillway structure itself consists of curved overflow sections, and reinforced piers to support the gates. A submerged concrete apron and energy dissipation bucket are provided below the spillways to minimise rock erosion.

* Mr Duguid was Resident Engineer on the Bearspaw Project.

## *Purpose of Plant*

While the production of power was the primary purpose of the project, the decision to carry through the development at this time was partly due to the recommendation of the Royal Commission on Bow River Floods in 1952.

It was hoped by the Commission that the Bearspaw forebay would act as an ice trap for frazzle ice flowing in the river, and thus lessen, or prevent, the winter flooding in Bowness and Calgary which sometimes occurs when ice dams are built up at various points on the river. It is known that the Bearspaw forebay will trap ice flowing from upriver, but it will require several winters to test the effectiveness of the project as far as flooding is concerned. However, the company engineers are very doubtful if much improvement will be noticed due to the rapid rate at which ice is known to form between Bearspaw and the City of Calgary.

The Bearspaw forebay serves a further useful purpose in allowing the installation of an additional 30,000 h.p. unit at the Ghost plant. The high flows resulting from this additional turbine can be re-regulated by Bearspaw.

*This view of the plant shows the spillway structure with three main gates, the power house and the 870 ft long earth fill dam. The C.P.R. line runs along the further edge of the reservoir*

## *Investigations*

Surveys and site investigations were carried out prior to 1953 to select a suitable site, and the present locations were selected to take advantage of the most easterly constriction of the Bow River valley, so that ice could be trapped as close to the City as possible with a reasonably short dam. At this point also the bed rock had an overburden of only four to ten feet of gravel, thus requiring only shallow excavation for the foundations. Diamond drilling was carried out to determine the nature and depth of rock for foundations, and construction work commenced in the late fall of 1952.

## *Brief Description of Structure*

The dam itself can be considered as of four parts and all are founded on bedrock. These parts are:

(*1*) The north end of the dam abuts on the C.P.R. track, and for 870 feet it consists of an earth dam, having a compacted clay core between gravel embankments. This section has 25 foot wide top and a maximum height of 63 feet at its south end. It tapers out at its north end at the railway embankment. Rip rap protection is provided on the upstream face and a rock toe gives the necessary drainage on the downstream side. The dam contains 64,600 cubic yards of clay, 180,000 cubic yards of gravel and 11,800 cubic yards of rock.

(*2*) The south end of the earth dam joins on to the concrete diversion (or transition) structure, 120 feet long, which contains four 18 feet wide sluices between concrete piers. These sluices were used to pass the river flow while work was being carried out in the river bed. After this function was complete the sluices were blocked with concrete walls and an earth fill was carried over the structure. This section now forms the transition between the earth dam and the power house. The actual junction between the clay core and the north end of the diversion structure consists of a sloping concrete cup which has vertical corrugations against which the clay makes a tight seal.

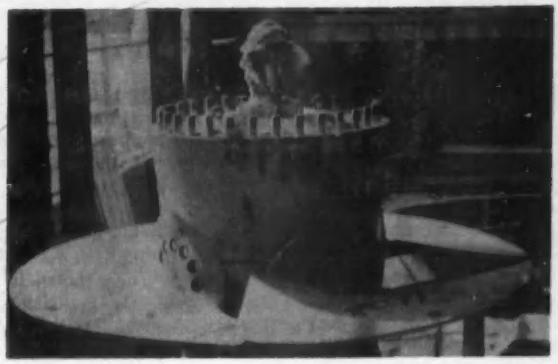
(*3*) The south end of the diversion section joins on to the power house intake structure, which is 56 feet along the line of the dam. The intake is protected by trash racks behind which the two head gates (19 feet wide and 26 feet high) operate. Provision for unwatering the gates behind stoplogs has been made.

The power house itself is 140 feet long lying almost east and west, and it houses the turbine and generator, together with all associated mechanical and electrical equipment. An overhead crane with a lifting capacity of 110 tons is provided for handling the heavy equipment. There are five floors in the building, one of which is to be used as the system control centre for the Calgary area. The plant is equipped for semi-automatic operation. The two draft tube gates are 20 feet wide by 18 feet high.

(*4*) The south side of the intake structure joins on to the spillway dam, 200 feet long, which contains the three flood gates, each measuring 50 feet wide by 31½ feet high. These gates are of the flat fixed-roller type and weigh about 100 tons each. At the south end of these and against the steep rock face of the river's south bank there is a small regulating gate, 15 feet wide by 21 feet high. Stoplog handling equipment is provided for all these gates so that any necessary repairs can be effected in the dry.

## *Construction Procedure*

A certain amount of preparatory work was carried out late in 1952 and this included building an access road and also a clay and gravel cofferdam around the area on which the diversion sluices were to be constructed. Screening of concrete aggregate was also commended. The full construction programme got under way in March 1953 after the erection of the concrete mixing plant and the necessary office buildings.



*Turbine propeller with variable pitch blades prior to installation. The blades are in the fully closed position*

The main stages were: (*1*) Construction of the diversion sluice structure, after unwatering the cofferdam and removing ice from the area. This work included construction of the two concrete retaining walls to act as part of the river cofferdam. (*2*) Construction of the earth fill dam up to the junction with the concrete diversion structure. This included excavation of a core trench to bedrock and placing of a rolled fill fines core. This phase of work progressed concurrently with phase (*1*). (*3*) Diversion of the river through the diversion channel and structure, and construction of a clay and gravel cofferdam around the power house and spillway structure area, which lies in the original river bed. (*4*) Excavation of over 20,000 cubic yards of rock for the foundation of the spillway structure and power house. (*5*) Construction of the power house and spillway concrete structures including installation of turbine, generator and spillway gates. The total quantity of concrete in these structures is in excess of 24,000 cubic yards. (*6*) Raising of about one mile of the C.P.R. main line up to three feet. Also placing of over 80,000 cubic yards of gravel and 10,000 cubic yards of rock as protection for the railroad embankment. (*7*) Removal of the river cofferdam and closing of the diversion sluices with concrete walls, causing the re-diversion of the flow over the spillway structure and down the original river channel. (*8*) Excavation of a 3,500 foot long tailrace channel by the removal of over 90,000 cubic yards of gravel. (*9*) Construction of a 13·2/72 kV substation and transmission line links to the Company system. (*10*) Completion of the earth dam, by carrying the gravel embankment over the diversion structure to provide the required stability.

When this was carried out the main gates were closed, allowing the reservoir to fill up to full supply level and the plant was ready for operation. Of these construction steps, (*1*) to (*4*) were completed in 1953 and (*5*) was under way; (*5*) to (*10*) were completed by November 1954. In addition to these main steps, such other work as clearing and burning trees in the reservoir area was carried out at the most suitable seasons throughout the job. Work was completed on schedule in November 1954, and after testing, the plant went into full operation in December. Total cost of the project was about $4,500,000.

Considerable civil engineering problems had to be solved in the construction, due to bad and cavitated bedrock and low cost clay-core gravel cofferdams were extensively used for dewatering. Electric pumps were used for all continuous services with standby petrol driven units. Concrete was made from local aggregates and this also presented some difficulty due to excess fines and entrained air.

# Hard Water and Immersion Heaters

WHEN immersion heaters of high specific loading are used in hard water districts, the formation of carbonate scale presents a serious problem as the heat transfer is reduced with consequent overheating of the heater. For a considerable time the Electrical Research Association has been working on this problem, and the results of this work have now become generally available in Report Y/T16 by M. V. Griffith and H. M. Browning.

It was unfortunate that despite the work undertaken it was concluded that neither surface material, nor surface finish had any useful effect on the rate of scale deposition. It may, however, be of interest to recapitulate the extent of work carried out. The heaters used were made from magnesia-insulated, copper-sheathed, commercial elements, bent into a "U" shape, and loaded up to 50 W/sq in. Total immersed area was 3 sq in. and the height of water above the heater was 0·75 in. These heaters were included in rectangular test cells made of thin brass, and through which water could flow entering and leaving by ¼ in. diameter apertures. For most of the tests the sheaths of the cables and the brass walls were metallically connected together and kept at earth potential. Formation of scale could be observed through a glass window either directly by a microscope or recorded photographically. Local water was used with a temporary hardness of 16·7 parts/100,000 and a total hardness of 30·2 parts/100,000. The heaters were plated (two of each) commercially with gold, silver, rhodium, chromium, nickel, and tin, and of each pair one was highly polished and one left matt. In addition an element sheathed with Monel metal was tested, and one with a graphite surface on copper. The results of testing were inconclusive. Field tests were also carried out and various chemical and electrical inhibitors used. Again, the results were inconclusive.

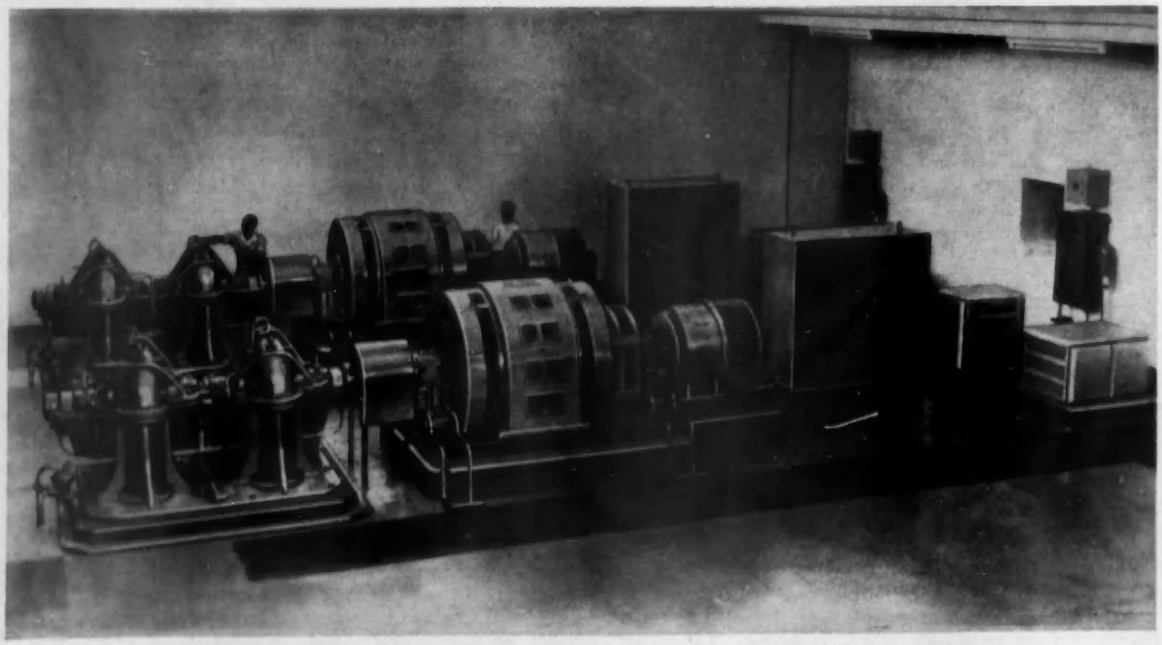
The Report states that "once an immersed hot surface, at a temperature approximating that of boiling water becomes covered with a complete layer of scale, the inhibiting effect of surface treatment either by plating with another metal or by removing surface irregularities is non-existant for all practical purposes."

# HUNYANI POORT PUMPING SCHEME

THE water supply to the City of Salisbury, Southern Rhodesia, combined with the general irrigation scheme on the Hunyani River, provides an interesting example of the utilisation of electric power in the industrial development of Africa.

Hunyani Poort Dam, constructed on Lake McIlwaine, has a capacity of 55,000,000 gallons. The nearby pumping station, comprising a pump house and filtration plant, delivers 400,000 gallons an hour—firstly to the Warren Hills booster station, against a head of 476 ft, and from there to Salisbury against a head of 335 ft. The pipelines are 30 in. in diameter, in length 81,000 ft from Hunyani Poort to Warren Hills, and 33,600 ft from the booster station to the municipal reservoir at Alexandra Park.

At both the pumping and booster stations the pumps are direct coupled to Metropolitan-Vickers 1,500 r.p.m. synchronous induction motors, of 1,250 h.p. at Hunyani Poort and 880 h.p. at Warren Hills, and with "VAX" control arranged to maintain approximately unity power factor from no-load to full load. Electricity supply is by overhead distribution, 33 kV at Hunyani Poort and 11 kV at Warren Hills, stepped down to 3,300 V for the motors.



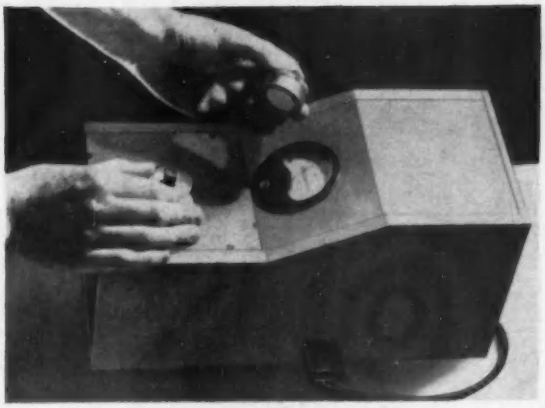
*Interior of Hunyani Poort pumping station showing Metropolitan-Vickers 1,250 h.p. VAX motors and pumps*

# Fluorescent Lamp Development

## *An Instrument for Checking Powder Luminance*

DEVELOPMENT of fluorescent tubes with higher efficiencies is mainly dependent on improvement in the quality of the phosphors used in the fluorescent coating. These phosphors are excited by short-wave ultra-violet radiation from the mercury discharge, and consequently the photometric brightness, or luminance, of the powder under a given amount of radiation is an important factor in the determination of light output.

The continuous research and development programme on phosphors makes it desirable to be able to assess the quality of each modified or improved powder quickly and simply and, as an aid to production, it is important to check rapidly the luminance of successive batches of a particular product. It is, therefore, important that a means should be devised for rapid assessment of the luminance performance of experimental phosphors before the stage of full lamp test is reached.

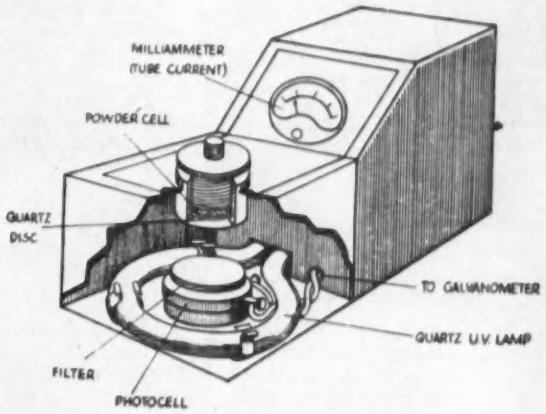


*External view of photometer for assessing relative luminance of fluorescent powders*

A simple photometer has, therefore, been developed at the Research Laboratories of the General Electric Co., Ltd., to measure the comparative luminances of these materials. It is used not only in laboratory experimental work but also for routine factory testing of batches of phosphor and has a repetition accuracy of within 2%.

The photometer consists essentially of a cubical box with a totally black inner surface and a small circular hole in the centre of a hinged lid. Short wave ultra-violet radiation is provided by a low pressure mercury vapour discharge in a quartz tube. This tube is bent into a circular shape round a photocell. The photocell is of the rectifier type and is covered by a filter which gives it an approximate "average eye" response. The tube and photocell unit are mounted in the base of the box with their centres vertically below the lid aperture. This arrangement ensures that no direct light from the ultra-violet tube falls on the photocell.

One of the main problems in comparing the luminances of different phosphors is to obtain a standard fluorescing surface. This has been solved by designing a standard circular glass box or "cell" which holds about 5 grammes of phosphor. When the lid of the cell is screwed down,




*Cut away diagram of the photometer*

the powder is compressed into a layer 1-2 mm thick and a uniform and repeatable surface is obtained on the transparent window in the base of the cell.

For rapid comparison of luminances, two such cells are used, both having crystal quartz windows. One cell is filled with the powder under test and the other with a standard material. This is a phosphor which is of the same colour, type and general composition as that under test. The test procedure is to place first the cell containing the standard, and then the cell containing new powder into the upper hole in the photometer. The ultra-violet radiation which reaches the window of each cell causes the powder to fluoresce. As the fluorescent light falls on the photocell, the different currents produced, which are dependent on the luminance of the phosphor layer, are read off on a galvanometer.

A small quantity of visible light is also emitted by the ultra-violet lamp and reflected from the surface of the phosphor. This amounts to about 30% of the total radiation falling on the photocell. To allow for this visible light in assessing the relative luminances of the phosphors, a third cell, also containing the standard phosphor but having a window made of glass, is now introduced. The glass prevents ultra-violet radiation reaching the phosphor so that only reflected visible radiation from an ultra-violet lamp reaches the photocell. This component can then be subtracted from the figures previously obtained, giving the required ratio of sample to standard fluorescence only.

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## Steam Power Plant

THE engineer whose occupation is concerned with modern steam raising plant will find a wealth of information in a publication issued by Simon-Carves Ltd. under the title of "Steam Power Plant." This well produced and comprehensively illustrated volume details the principles of Simon-Carves water tube boilers and gives details of the necessary boiler ancillary plant. A large section is devoted to details of specific boilers ordered from the company, and the final section gives much technical data of importance to the practical engineer.

# Measuring Pressure and Movement

*USE OF PHOTO-ELECTRIC CELLS FOR FUEL READINGS*

MANY solutions have been made to the problem of measuring small displacements. An unusual system is described in the June *C.A.V. Engineering Review* where the attack was made on difficulties associated with the measurement of fuel-line pressures and needle movements in fuel injection systems. The gauge consists essentially of an electric lamp source, a shutter and a photographic electric cell, the shutter being operated by the movement of a small diaphragm of only 0·8 in. diameter. The thickness of the diaphragm is 0·01 in. or more depending on the pressure to be measured.

As the system permits static calibration and gives a reasonable output, the associated electronic amplifying equipment can be correspondingly simple.

## *Arrangement of Equipment*

As shown diagramatically, the slit shutter controls the amount of light from a filament lamp falling on the sensitive surface of a photocell. The total light flux is proportional to the shutter opening. There is, therefore, a linear relation between shutter displacement and photocell current.

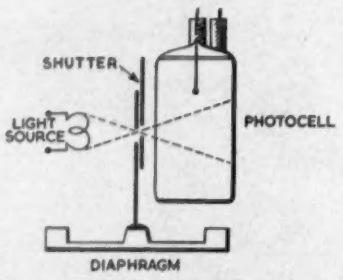
The output is limited by the current taken from the photocell which is 2·5 micro-amperes and the relationship between the output and the shutter opening is linear above values of 0·6 micro-amperes.

In the pressure gauges the shutter is set to an opening of 0·004 in. with the diaphragm undeflected so that the output is linear over the full working range of the diaphragm which is normally 0·005 in. The frequency response of the photo-electric head may be limited by the characteristic of the photocell or by the time constant of the output circuit. With a length of low capacitance cable and a 100,000 ohm output resistor the time constant is of the order of 10 microsecs. A sudden displacement of the shutter will then be reproduced as output voltage change in such a way that 90% of the final value is attained in 100 microsecs, that is in about 2° rotation of an engine running at 3,000 r.p.m.

The gauges are made for measuring fuel line pressure, injector needle lift and cylinder pressure. The photo-electric head common to both the pressure gauges has also been used separately for other applications requiring the measurement of small displacements. The diaphragms may, of course, be changed to alter the range of a gauge and as they are made with the moving part of the shutter attached no special skill is required to change a diaphragm and reset the shutter. Both types of pressure gauge may be used with special needle valves for rapid static calibration. They are arranged so that the diaphragm can be connected to the pressure to be measured, to the atmosphere or to an additional pressure connection to which a known static calibrating pressure can be applied.

It is intended that a pressure phenomenon having been recorded, zero pressure and a fixed calibrating pressure shall be recorded at once on the same film so that drift errors may be minimised. The pressure to be measured is sealed off from the rest of the apparatus during calibration without interrupting the running of the engine or pump being tested.

The needle lift gauge can be calibrated by screwing down the whole of the photo-electric head on a micrometer screw. Uninterrupted calibration lines can be obtained if the engine under test is stopped, but since a part of the trace usually shows zero displacement, calibration can also be made without stopping the engine by displacing the whole trace a known amount and measuring the distance between the two zero readings.

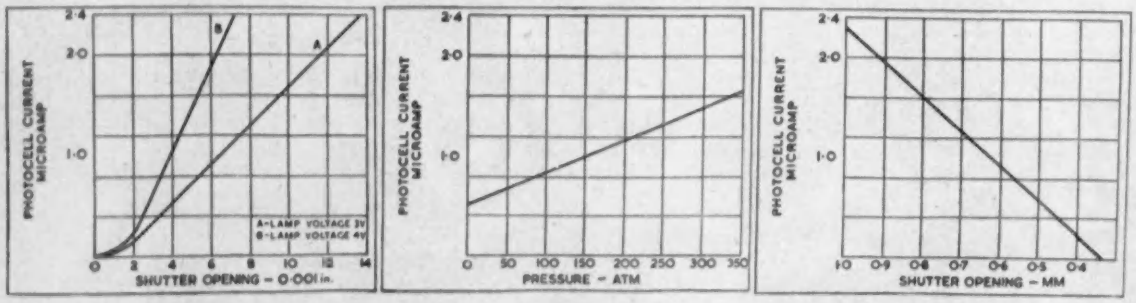



*Diagrammatic arrangement of lamp, diaphragm, shutter and photocell*

Four diaphragms are used to cover the normal range of pipe line and cylinder pressures in order to avoid diaphragm inertia effects. The photocells used are stated to withstand heat at 80° C and no trouble due to overheat has yet been experienced. The indicator unit consists of a cathode ray tube with its associated amplifier and time base, and in the case under consideration, the time base is so controlled to allow a diagram of the duration of a normal diesel-fuel injection to be expanded if desired to the full width of the tube without affecting the frequency of synchronisation.

By the development of an electronic shutter it has been made practicable to photograph the indicator diagrams directly from a cathode ray tube. The starter exposure is then determined by the trigger impulse generated at a fixed point with reference to crankshaft degrees.

*From left to right. (1) Relation between shutter opening and photocell current. (2) Relation between pressure and photocell current. (3) Relation between needlelift and photocell current*



# PROBLEMS AND PRACTICE

## *In Engineering*

*Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.*

### *Rude Awakening*

SOME time ago I was witness to what was, as it happened, a rather amusing incident, although in certain circumstances, it could have had serious consequences. A number of concrete lighting standards with a lantern mounting height of 15 ft, had been erected in an urban district. It was at that time generally assumed, there being no earthing arrangements made, that the normal inaccessibility of the lantern was sufficient for reasonable safety.

One of these lighting standards was positioned at the local bus stop, and naturally it became a very convenient "leaning" post for certain people waiting for the bus. One night I was passing this particular standard, on the opposite side of the roadway, at about the time the street-lighting was coming into operation.

A violent exclamation drew my attention to the lighting standard whose lantern, I noticed, was illuminated, and to a local workman "dancing like a dervish" on the pavement below it. Going across the road to investigate, I discovered that the man, more than usually tired, had sat down by the standard to await his bus, when to use his expression, the concrete standard "threw" him across the pavement.

Investigation proved that he had received an electric shock at the time the lamp "switched" on. A fixing screw had worked loose in the lantern, bridging the "phase" terminal and the metal-work. This in turn, via the conduit in the swan-neck bracket arm had made the metal re-inforcing in the standard "alive." As this metal-work came very close to the surface of the concrete near to the base of the standard, his position at the time hadn't improved matters. After this event steps were taken to provide all lanterns, no matter where fitted, with adequate earthing systems.—*G. W. Clegg.*

### *Another Demagnetised Alternator*

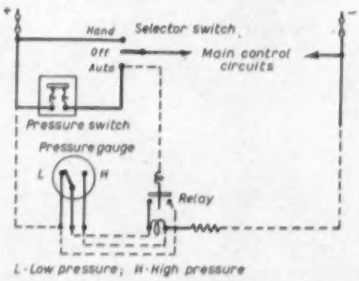
I WAS recently called in to look at an alternator which had ceased to generate, and which my clients feared was burnt out. Tests showed nothing apparently wrong with the windings, but the exciter was not exciting. More careful testing with a multi-range voltmeter then gave the following results. Exciter (maximum working pressure 90 V) as connected gave 2 V; armature only (field disconnected) 1 V; field reversed 0·8 V.

The machine was a rotating armature (converted d.c.) type, with the exciter mounted on top of the alternator and belt driven. It was thought that the trouble might be due to the stray field from the alternator being opposite to that of the exciter, and so giving a demagnetising effect. The residual magnetism of the exciter was, therefore, reversed by applying a d.c. voltage to its field, and the connections altered so that the alternator field current would still flow in the same direction. With its field disconnected the exciter now gave an output of 10 V and on connecting the field the machine worked normally. It seems that this is a point which should always be borne in mind with this type of alternator.—*J. Mellanby.*

### *Circuit Weakness*

RECENT notes on "Sticking Contacts" by Messrs Green and Butcher bring to mind several instances where trouble has been experienced by a weakness in circuit design, and which may often provide a keen maintenance man the opportunity to make successful modifications.

Such a case came to my notice recently where a 70 h.p., d.c. motor driving an air compressor, was automatically controlled by a pressure gauge in which were two sets of contacts to make and break a relay circuit in the motor control panel. These pressure gauge contacts were necessarily very light, and in the low pressure position one pair energised the relay which set up the starting sequence whilst in the high pressure point the contact short-circuited the relay coil to open the main control. Pressure gauge contact resistance, however, was at times sufficiently high to partially nullify the short-circuit of the relay coil and its residual magnetism then kept its contacts closed, the compressor continuing to run until the pressure in the air reservoir operated the safety valve with a great deal of noise, startling to anyone in the vicinity, to say nothing of wasted power.




*Improved circuit for controlling a compressor, the pressure gauge being replaced by a mercury switch diaphragm. Dotted lines show original circuit*

To overcome this inherent weakness a pressure control embodying a mercury switch and variable for selected pressure, was obtained, and connected as shown in the diagram to eliminate both pressure gauge and relay and the recurring attention they have demanded.—*T. H. Snelson.*

### *The Magic Magnet*

ON carcase electrical work, piecework plasterers have been filling our outlet steel boxes with cement, leaving no trace on the walls. In some cases we have had the utmost difficulty in locating the exact position of some of the boxes in order to dig out.

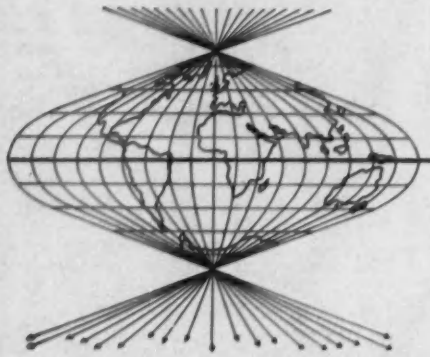
There are, of course, elaborate electronic devices for obtaining the precise location but we found that we could trace out the position with a small pocket compass. For ceiling boxes, provided they are not too deeply embedded, a small powerful horseshoe magnet can be used.

The pocket compass is now forming part of our general equipment, since we have found further uses as an aid to installation practice. I am sure that readers can find additional scope for its application. Only too often carpenters, when fixing skirtings, drive nails right through the conduits into the cables and it is not always easy to locate if the nail-holes are filled with putty and painted over. The compass needle points to the exact position and serves the same purpose when it is necessary to cut out tubing in new or old work.

When cutting through walls I have always found a neater hole can be made if the operation can be carried out from both sides. In many cases it is difficult to obtain the precise measurement to give the place in line with and opposite the commencement position. If the cutting tool is driven in part of the way it can be located exactly with the compass needle from the other side.—*M. N.*

### *Oil Creepage along Shafts*

WORN bearings are often the cause of oil creepage along main shafts on to the windings of electrical machines. Where it is inopportune to renew the bearing immediately, a temporary cure can be effected by binding a ring of felt round the shaft about ¼ in. from the bearing. The felt, being absorbent, will retain a considerable quantity of oil for some time, whilst a number of glues are available today for attaching it to the shaft.—*W. E. W.*



# OVERSEAS NEWS

*A SUMMARY OF IMPORTANT EVENTS*

## CANADA

### Gas Turbines Wanted

Now on a return visit to Britain is Mr T. Ingledow, vice-president of the British Columbia Electric Co. He is seeking British firms who might be able to supply gas turbine sets of around 75,000 kW each, apparently. He has already had preliminary discussions on the matter with such concerns as British Thomson-Houston Co., English Electric Co., and Metropolitan-Vickers, and he is now in this country to carry negotiations a step further, if possible. British firms have manufactured a number of gas turbine generating sets of comparatively small size, but 75,000 kW is considerably higher than anything so far made by any concern, as far as we are aware. Mr Ingledow has pointed out that a natural gas pipeline is being constructed from the Peace River Gas Fields, which should reach the industrial centre of Vancouver next year. The idea is to use natural gas as fuel for the new turbines, and Mr Ingledow now wants to know if it is possible to build large-size gas turbines with guaranteed reliability for the purpose. It would seem that there is a valuable order awaiting the firm able to fulfil the conditions.

### Water Shortage

Many of the large rivers in Canada, such as the Ottawa and the St. Lawrence have lately been at their lowest level for fifty years, and unless prolonged heavy rain fal's very quickly it is feared that the output of the numerous hydro-electric plants may be severely affected, perhaps to the extent of causing a power shortage.

## COLOMBIA

### Power Plan

A comprehensive, long-range national electrification programme calling for an expenditure of about $1,200m by 1970 is being studied by the Government of Colombia. The plan will progressively increase Colombia's power-generating capacity from its present 338,000 kW to 2,695,000 kW by that year. Transmission and distribution facilities are to be expanded accordingly. The study which produced the programme was jointly undertaken in 1953 by the Gibbs and Hill Co., New York consulting engineers, and Electricité de France, the French national utility. The two organisations carried out their assignment with co-ordination by the Colombian National Institute of Water and Electric Power Development. The purpose of the programme is to provide power essential to Colombia's planned industrial and economic growth. The programme, which has been submitted to Dr Manuel Archiles Monroy, Colombian Minister of Development, contemplates an increase in power-generating capacity to 1,150,000 kW by 1960, to 1,792,000 kW by 1965, and to 2,695,000 kW in 1970. It is estimated that one-half of the sum required for the programme will be spent on equipment outside Colombia.

## BRITISH GUIANA

### Another Survey

A further aerial survey of British Guiana is to be undertaken by the Directorate of Colonial Surveys. The contract for the task has been placed with Hunting Aerosurveys Ltd. This will be the fourth aerial survey contract in British Guiana since the war. The 54,000 sq mile of territory includes some of the wildest and most unexplored country in the world. The aerial photography will be used in the first place to provide maps which are essential forerunners of any industrial or economic programme. A hydro-electric project has already been suggested to utilise the Kaieteur Falls, which has a drop of 750 ft. There are also considerable mineral possibilities in the Pakaraima mountains.

## U.S.A.

### Farm Electrification

During the investigations into farming conditions in the United States and Canada, on behalf of the Nuffield Foundation, a five-man team has found that the facility with which Americans had turned to machines was due to plentiful supplies of cheap electricity. Just back from their tour, the mission has stated that they found that 75% of American farms had electricity compared with about 50% in Britain. Of the many farms visited, members referred to one installation where the milking sheds were cleaned with powered gear, another where elevators were used for moving fodder and other material, and a third, where silage was cut by electricity and conveyed by belt to the cowsheds. They issued a warning, however, that because of the enthusiasm for machines, the use of equipment had occasionally exceeded the bounds of real efficiency. Some work could have been done more quickly and less expensively by manual labour! The delegation is to issue a full report in due course.

### Nuclear Plant

The Pennsylvania Power and Light Co., and Westinghouse Electric Corporation are to build a nuclear power plant at Allentown, Pennsylvania, to compete commercially with the normal steam generating stations, it is reported. It is hoped to have the power station finished by 1962.

## EUROPE

### Nuclear Development

The West German Federal Government has decided to build its first atomic pile on a site near Karlsruhe. In announcing this, the Government has stated that with the operation of the Paris treaties, the restrictions on the development of nuclear energy in West Germany have substantially disappeared. The Federal Government is now examining all possibilities for nuclear research and for the technological and scientific exploration of nuclear energy for peaceful purposes. The question is also being considered how the co-operation of the Max Planck Institute for Physics at Göttingen and of its head, Prof Heisenburg, can be secured in the construction and work of the Karlsruhe station, it is stated.

### Credit for Spain

The Export-Import Bank of Washington has just authorised a credit to S. A. Hidroelectrica Espanola amounting to $8,500,000 for the purpose of purchasing in the United States two 62,500 kW, and one 125,000 kW generators for installation in the new Escombreras plant which is now being constructed by that undertaking at Cartagena. When completed, this plant will be the largest thermal electric power installation in Spain. The credit will be available to finance up to 59% of the cost of the purchase in the U.S. of an estimated cost of $21 millions. The remainder of the cost of U.S. purchases will be paid from other funds and from credits extended by U.S. suppliers in par-

ticipation with the Export-Import Bank. The International General Electric Co. is acting as the prime contractor for Hidroelectrica in obtaining all U.S. equipment and services and will share with other U.S. suppliers in the financial arrangements. The terms of the credit provide for repayment over a 7½ year period commencing in 1957, at a rate of 5% p.a. Obligations to be issued by Hidroelectrica under this credit will be guaranteed by the Banco de Vizcaya. Hidroelectrica Espanola is the leading producer of electric power in Central and Eastern Spain and the addition of the three abovementioned generator units will greatly assist it in firming up Spain's much needed power requirements.

## KENYA

### Tana Plant Commissioned

Kenya's latest hydro-electric scheme, on the Lower Tana River, was officially commissioned by Sir Evelyn Baring, Governor of Kenya, on 3 Aug. The new plant consists of two 4,000 kW vertical turbo-alternators, the first of which has been in operation for a few months. The plant is housed in what is virtually an extension of the existing Maragua hydro-electric station which has been utilising the waters of the Maragua river; but for the two new 4,000 kW sets, water is taken from the Tana River and passed through a 9,000 ft tunnel. The project, which has cost about £1,500,000 is situated 55 miles north of Nairobi, and is operated by the newly formed Kenya Power Co. Contractors for the scheme were Balfour, Beatty and Co., Ltd. Another power station, the Wanji, a few miles away, was completed last year at a cost of £1,250,000. At last week's commissioning ceremony, Sir Evelyn Baring said that these projects, together with the projected bulk supply line from Owen Falls to Nairobi, represented a private investment of over £10 millions.

## PAKISTAN

### More Contracts

Contracts for Canada's share in a power and irrigation project in West Pakistan, estimated to cost $50 millions, have been awarded to firms in Niagara Falls, Ontario, and Montreal. H. G. Acres and Co. of Niagara Falls, are to design and supervise the project, while Angus Robertson, of Montreal, will provide construction experts and equipment. The power and irrigation scheme, which is included in the Colombo Plan, will take 3½ years to complete, it is estimated. The Pakistan Government will share the cost of the work.

## AUSTRALIA

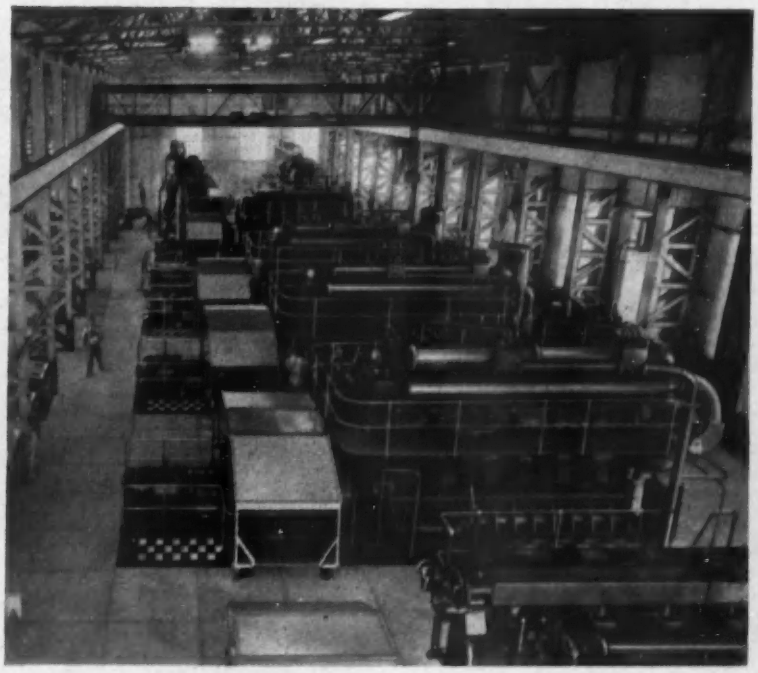
### Financial Investigation

Two financial experts from Sydney have been asked to review and report on the financial aspects of operations of the Hydro-Electric Commission of Tasmania. They are Mr R. R. Farrell, treasurer of the Sydney County Council, and Mr M. H. Rout, accountant of the Electricity Commission of New South Wales. Announcing this, Mr Cosgrove, the Premier, said untrue charges had been made in the Press that extravagance and maladministration were the reasons for higher power charges (to which we referred last week). The Government considered that the affairs of the Commission had been administered efficiently and with proper regard for economy. Mr Cosgrove said the figure for the cost of supply in Tasmania left no room for extravagance. The fact that the average cost of power sold by the commission in 1953-54 was ·604d. a unit compared with an average for other States of 2·511d., and a minimum of 2·152d. in Victoria, supported this view.

## NEW ZEALAND

### Power Outlook

Work on the construction of the new Benmore hydro-electric project would now probably start a year earlier, in 1959, the Minister of Works, Mr W. S. Goosman, stated recently. All the planning and investigation had been done for the 340,000 kW project. Mr Goosman said that if circumstances dictated the need for it, construction could start on Benmore earlier than 1959, but this would depend on the demand for power. The present generating capacity in the South Island was 290,000 kW. When Roxburgh was fully in operation another 320,000 kW would become available. It was estimated that this quantity of power would be adequate and the Government had been guided by these estimates in reaching its decision on Benmore. Asked whether there was any foundation in reports that the Government was considering taking power from the South Island across Cook Strait to help the North Island power problem, the Minister said that the position was being watched carefully. There was no present intention of doing so, he said, because there was no type of cable suitable for use across waterways such as Cook Strait. There was also the problem of the generation of power at sufficiently high voltage to carry across the strait. For the most part, he said, power was produced in New Zealand at 110 kV or 220 kV. For transmission across the waterway of Cook Strait 440 kV would be needed. The question of power failures through cable breakages had to be considered. A Canadian experiment resulted in six breakages in the cable.



*Big Pond power station, illustrated alongside, provides the electricity supply for the town and island of Nassau, in the Bahamas. Operated by the Bahamas Government, the station has thirteen diesel generating sets installed totalling about 9,000 kW. Of the total, 6,090 kW is provided by six Ruston and Hornsby machines which have been supplied at various dates from 1939. These comprise four 6VLBX pressure-charged diesels, each of 1,170 b.h.p., and two 9VOX pressure-charged units each of 2,410 b.h.p. As we reported on 26 May, proposals have been put forward under which the Electricity Department would change over to steam power generation in the near future. Mr A. Kennedy, the director of the Electrical Department, has emphasised that at the moment the project is only in the planning stage, and it is not anticipated that this will be completed before next June at least*

# Personalities

## IN THE INDUSTRY

Assistant engineer, operation and efficiency at Littlebrook power station, South Eastern Division, C.E.A., **Mr P. E. Dickinson** has been appointed boiler house superintendent at Battersea power station, London Division.

**Mr C. Allardice** has been appointed to the newly-created position of Atomic Energy Adviser to the World Bank.

**Mr Ronald Newell,** Harland and Wolff's engineering manager at Belfast, has been appointed to the Board. Mr V. V. Spark, a director, chief accountant and secretary, has resigned. He has been with the company for 45 years, joining as assistant accountant in 1910 and becoming chief accountant in 1932. He was appointed to the Board in 1943 and has been secretary since 1950. **Mr G. H. Patton,** who has been with the company for many years, has been appointed secretary and **Mr W. T. Underwood,** at present assistant accountant, has been appointed chief accountant.

**Mr F. J. Batten,** M.I.E.E., has been appointed general manager of Fairfield Cables Pty. Ltd., of Australia. His former position of deputy contract manager of W. T. Henley's Telegraph Works Co., Ltd., is now filled by **Mr D. F. Capeling,** A.M.I.E.E., previously assistant contract manager, to which post **Mr R. H. Simpson,** A.M.I.E.E., has been appointed. Mr Batten, who received his engineering training at Northampton Polytechnic, London, joined Henley's Contract Department in 1924 as a junior. In 1927 he was transferred to the Outdoor Testing Section and later his duties extended to a wider technical field, in connection with h.v. cable installations. In 1945 he was promoted to assistant contract manager and in 1951 he became deputy contract manager. Mr D. F. Capeling, who has taken over the latter post, joined Henley's Sales Department in 1929 and was transferred to the Contract Department in 1937. He was appointed assitsant contract manager in 1951. Mr R. H. Simpson, joined Henley's as a junior in 1938 and later that year was transferred to the Contract Department. He served in the Forces from 1940 to 1946 and on returning to Henley's was engaged on technical duties.

Due to retire about the end of Sept. next is **Mr W. T. Gann,** M.B.E., M.I.E.E., district manager at Southport to the Merseyside and North Wales Electricity Board. Mr Gann commenced his long association with the Southport undertaking back in 1913, he became deputy borough electrical engineer in 1935 and was promoted to borough electrical engineer in July, 1937. He started his career in 1909 when he joined the Dover Corporation undertaking, and subsequently gained two years' experience at Rochdale before going to Southport.

**Mr H. H. Mullens,** B.SC., M.I.E.E., has been appointed a non-executive director of Dorman Long and Co., Ltd. Before his appointment last year as managing director of A. Reyrolle and Co., Ltd., Mr Mullens was chairman of the North Eastern Electricity Board and had been a part-time member of the B.E.A. From 1931 to 1945 Mr Mullens served in Middlesbrough with the North Eastern Electric Supply Co. In 1936 he became assistant to the power engineer of the southern area of N.E.S.Co., taking over the senior position in the early days of the war. He later became deputy general manager of N.E.S.Co., and in 1947 was appointed chairman of the North Eastern Electricity Board. During his work on Tees-side, Mr Mullens was closely connected with local industries and a member of various local bodies, including the Chamber of Commerce. Mr Mullens, who is 55, joined the N.E.S.Co. in 1924 after serving his apprenticeship with Clarke, Chapman and Co., Ltd., of Gateshead.

Formerly Manager, Plant Section, Overseas Division of Crompton Parkinson Ltd., **Mr P. D. Osborn,** B.SC.(ENG.), A.M.I.E.E., has been appointed Sales Manager, Fractional H.P. motors, in succession to **Mr R. V. Powditch,** O.B.E., T.D., A.M.I.E.E., A.M.I.MECH.E.

Mr Osborn first joined the company in 1938 on completion of his engineering training as technical sales engineer with the London Plant Branch. He served with the Royal Engineers from 1940/1946 and on demobilisation rejoined the company as a fractional h.p. motor specialist sales engineer.

Early in 1947 he left Cromptons to join the United Africa Co., Ltd., with whom he gained experience of technical trading in Africa and Middle East territories, especially East and West Africa. He rejoined the Crompton organisation in September, 1953, was appointed to his present Plant Section position in Jan. 1954, and joined the company's Junior Board in March of this year.

To succeed **Mr J. O. Hammond** as Branch Manager Home Counties at Chelmsford is **Mr C. J. Hurd,** formerly manager of the Crompton Parkinson sub-office at Leicester.

Mr Hurd joined Cromptons as an apprentice in 1928 at Chelmsford and later served the company at Guiseley, Birmingham and Bristol. In 1939 he joined the company's agents, United Engineers Ltd., in Singapore. He was interned by the Japanese until 1945 and rejoined the company at Nottingham in 1946, taking up the Leicester post in 1950.

In regard to our note last week on the cable works appointments by Johnson and Phillips Ltd., we should make it clear that **Mr B. C. Brown** becomes assistant manager of the Rubber Cable Works, and **Mr W. Mann** is assistant manager of the Paper Cable Works.

Resident engineer on the Bearspaw hydro-electric project, Alberta, described on page 204 was **Mr D. R. Duguid,** B.SC., who is the son of **Major-General D. R. Duguid,** C.B., M.B.E., A.M.I.E.E., of Bridge of Allan, Stirlingshire. Born in Scotland,

*Mr F. J. Batten*

*Mr W. T. Gann*

*Mr P. D. Osborn*

*Mr D. R. Duguid*

*Mr S. Farrer*

Mr D. R. Duguid was with Balfour, Beatty and Co., Ltd., of Edinburgh, in 1947, being engaged as assistant civil engineer on the survey and construction of overhead power lines. He went to Canada in 1948, working first with the Department of Public Works in Alberta, and then as chief of the party surveying for a townsite at Kitimat, British Colombia. After a short period as sessional instructor in civil engineering at the University of British Colombia, he joined Montreal Engineers Ltd. with whom, in 1951/52, he was assistant resident engineer on the Mayo River hydro-electric development in Yukon territory.

Brown Brothers Ltd., announced the appointment to a post at head office in connection with their Garage Equipment interests of **Mr L. J. Curtis,** previously manager of the company's Bournemouth Branch. Mr Curtis has been with the company for 30 years.

To succeed him at Bournemouth is **Mr A. S. Renwick,** manager of Stoke-on-Trent Branch since 1938. **Mr S. J. Hillier,** assistant manager at Wolverhampton, succeeds Mr Renwick at Stoke.

**Dr J. N. Aldington,** B.SC., PH.D., A.M.I.E.E., F.INST.P., F.I.E.S., F.CHEM.SOC., a director of Siemens Brothers and Co., Ltd., has been appointed managing director of the company in succession to **Mr H. E. Humphries** who has resigned from the board. Dr Aldington is also managing director of Siemens Electric Lamps and Supplies Ltd. He was president of the Illuminating Engineering Society in 1949-50. In 1942 and again in 1946 he was awarded the Leon Gasker Memorial Premium of the I.E.S. for his papers on bright light sources, and in 1948 shared the Crompton award of the I.E.E. for a joint paper with Mr A. J. Meadowcroft on the flash tube. He is a member of the National Illumination Committee of Gt. Britain, and chairman of the British Secretariat of Committee 21, Light Sources, of the International Commission on Illumination. He joined the Siemens Lamp Works at Preston in 1936 as research physicist and head of the laboratories. In 1939 he became assistant works manager and head of the laboratories, and in 1948 was appointed director of research and deputy works manager. Dr Aldington has played a prominent part in research work and development in the lighting field in the past two decades.

**Mr S. Farrer** M.SC.(TECH.), M.I.E.E., M.I.MECH.E., M.I.I.A., M.AMER.I.E.E., has been appointed sole managing director of Simplex Electric Co., Ltd., in succession to Sir George Briggs.

After graduating from Manchester University, Mr Farrer worked for several years on the design of insulation, protective gear and switchgear for power stations distribution and for transmission up to 132 kV. Following a period of 8 years as chief research and technical engineer (electrical) at Ferguson Pailin Manchester Works, he joined South Wales Switchgear as chief engineer on design and production of Admiralty equipment switchgear and other products, later turning to consultancy work in industrial management.

In a reorganisation to further expansion of their London business, Dowding and Mills Ltd. have made several new appointments. **Mr P. L. Hollings,** formerly assistant to the general manager retains his position as London manager. **Mr P. A. Chambers,** the N.E. London area technical representative, has been appointed works superintendent, and **Mr V. H. Devis,** previously chief inspector of Brownings Electric Co., Ltd., has been engaged to take over the N.E. London area as technical representative. **Mr D. A. W. Clark,** B.SC.(ENG.), has now assumed control of the southern area as technical representative, whilst **Mr R. P. F. Todd** remains technical representative for the N.W. London area. **Mr W. L. Henderson,** A.M.I.E.E., retains his position as London sales manager.

**Mr H. E. S. Arlott,** branch commercial superintendent at Henley, to the Southern Electricity Board, has been appointed development officer for the Board's Salisbury district.

**Mr J. A. Broughall,** B.SC., M.I.E.E., Executive Officer (Electrical Engineering New Works and Development) British Railways Central Staff, has been appointed Electrical Engineer (Development) Chief Electrical Engineer's Department of the British Transport Commission.

To succeed **Sir Percy Mills,** K.B.E., as chairman of the National Research Development Corporation is **Sir Alan Saunders,** O.B.E., chairman of the British Sugar Corporation and J. J. G. Saunders and Sons. Sir Percy Mills, who resigned the post for business reasons, has been chairman since the inception of the corporation in 1949. He is chairman of W. T. Avery and deputy chairman of Lancashire Dynamo Holdings Ltd., and has just been appointed a director of Electric and Musical Industries Ltd.

New chairman and vice-chairman for the coming year elected at a recent meeting of the British Internal Combustion Engine Manufacturers' Association are **Messrs N. McCallum** and **Miles Beevor** respectively. Mr McCallum is a director of Harland and Wolff and Mr Beevor managing director of the Brush Group.

## OBITUARY

We regret to record the sudden death at Derby last Saturday of **Mr F. G. Penny,** M.INST.C.E., M.I.MECH.E. Mr Penny, who had been ill for a short time, was managing director of International Combustion (Holdings) Ltd., chairman of Aberdare Cables (Holdings) Ltd., and a director of many other companies. He was 66.

**Mr George Oldham,** one of the three joint managing directors of Oldham and Son Ltd., died on 1 Aug., aged 68. A grandson of the founder of the firm, Mr Oldham joined the family company in 1905. During his lifetime he has been actively concerned with all the developments of the firm. As a young engineer he specialised in the company's mining activities and was intimately connected with the production of the miners' electric lamps. He was also concerned with the production and development of the Oldham hatting machinery.

**Mr A. Travers,** A.M.I.E.E., of Tankerton, died on 30 July.

# BRITISH STANDARDS

**Glossary of Terms used in Radiology.** *B.S. 2579:1955. Price 10s.* Intended as an authoritative reference for medical and industrial radiologists and for general workers in radiology, B.S. 2597 includes over 750 terms and definitions. Its four main sections are, "General terms and physics," "Sources of ionizing radiation," "Radiography and fluoroscopy" and "Radiotherapy and radiation protection," and its comprehensive nature may be visualized by the fact that among these sections are terms relating to such subjects as: atomic physics, high voltage generating equipment, X-ray tubes and their accessories, particle accelerators, diffraction analysis, and isotopes in medicine.

**Flexible Polyvinyl Chloride Extrusion Compounds.** *B.S. 2571:1955. Price 5s.* This standard specifies three classes of compound as follows: (1) Compounds with specified electrical properties and having a volume resistivity of not less than $10^{12}$ ohm-cm at 23° C. (2) Compounds with specified electrical properties and having a volume resistivity not less than $5 \times 10^{8}$ ohm-cm at 23° C. (3) Compounds for which the electrical properties are not specified. Each of these classes is sub-divided into types so that in all 12 types of compounds are provided for. Requirements for composition, form and appearance are laid down, and limits are set for a number of physical and chemical properties.

**Wrought Aluminium for Electrical Purposes. Wire.** *B.S. 2627:1955. Price 2s. 6d.* The increasing use of aluminium for electrical conductors, in both cables and o.h. lines, is the main reason for the publication of this new document, which is the first of a series dealing with wrought aluminium and alloys used only for electrical purposes. Referring only to wire used for conductors, the standard is suitable for controlling the quality of wire supplied for making electrical components which are themselves covered by other standards, such as B.S. 215 and B.S. E21. Requirements specified include chemical composition, mechanical properties and resistivity.

**Copies** of the above British Standards may be obtained from the British Standards Institution, 2 Park St, W.1, at the prices stated.

# *Equipment for Industry*

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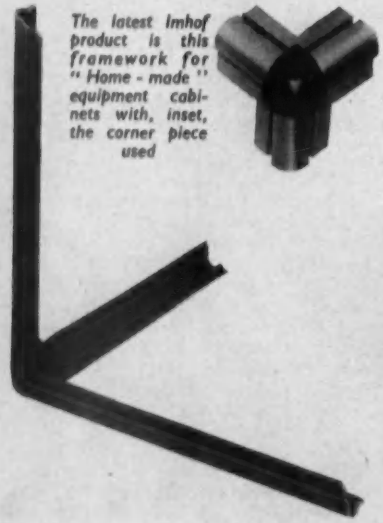
## Cabinet Kits by Imhof

A PLEASING presentation and suitably cased prototype may provide the final contributory factor which induces the customer to place an order. With the aid of a new "make it yourself" kit, manufacturers may now house their prototype equipment in cabinets having a neat, professional and well-designed appearance normally reserved for full scale production models. This new system consists of alloy extruded frame-members which may be cut to required lengths and joined by corner-connectors thus enabling a cabinet of desired dimensions to be erected quickly. Provision has been made for screw tapping or similar fixing and the rebated edge on the frame-member provides for a clean flush fitting of metal or plastic panels. Marketed by ALFRED IMHOF LTD., 112-116 New Oxford St, W.C.1, this system at present only provides right angle corner-connectors, but the makers intend to increase the system's versatility by producing a more comprehensive range of corner angles so that most rectilinear shapes may be produced.



*The latest Imhof product is this framework for "Home-made" equipment cabinets with, inset, the corner piece used*

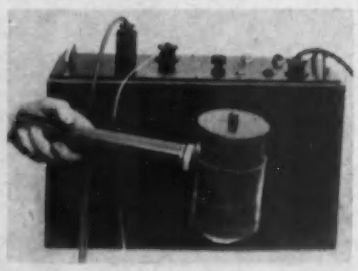
## Multiplier Improves C.T. Test Set

OBTAINING ratio and phase angle errors of current transformers by the Petch-Elliott current transformer testing set has been a familiar practice for many years. Hitherto, this instrument has only met the requirements of c.t. testing up to class "B" as specified in B.S. 81. But, by the recent addition of a multiplier unit also manufactured by ELLIOTT BROS. LTD., Lewisham, S.E.13, the standard c.t. test equipment may be extended to cater for transformers required to meet class "C" B.S. 81 and class "S" B.S. 2046. Testing a specimen transformer remains a simple operation, with or without the use of the multiplier. The combined equipment, with a X5 range on the test set, claims to cover errors of ±10% ratio and ±400 minutes phase angle.

*The Elliott multiplier set for current transformer testing*

## Applying Flock by Electrostatic Gun

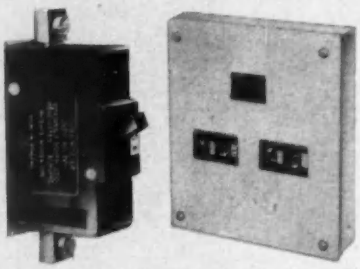
ILLUSTRATING yet another industrial application of high voltages, is the electrostatic precipitation of flock fibres end-on, to produce a velvet-like finish on almost any surface. This process and the necessary apparatus has been introduced naturally enough, by a concern manufacturing high voltage supply units. The essential feature of this equipment produced by HIVOLT LTD., 91-93 Princedale Rd, W.11, is the electrostatic flock gun which basically consists of a hopper for the fibre and a wire mesh charged by an E.H.T. supply. Vibrating the hopper causes the fibre to fall through the mesh, acquiring a positive charge in the process. Thus the fibres are readily attracted towards the surface to be coated which should previously have been treated with a suitable adhesive. Since the precipitated fibres are positively charged, a state of repulsion exists between them ensuring parallel alignment on reaching the adhesive coated area. Dissipating their charge on contact, the fibres not retained by the adhesive are attracted back to the charged mesh where they obtain a fresh charge before re-precipitation. Claiming little waste, the makers may well recommend the flock gun equipment as an economic proposition for coating large surface areas requiring a flock or similar finish.



*The electrostatic gun and equipment supplied by Hivolt for depositing flock*

## S.P. Miniature Circuit-Breakers

DESIGNED and manufactured by DORMAN AND SMITH LTD., Manchester, the "Loadmaster" miniature circuit-breaker is said to be suitable for both domestic and industrial equipment. This single pole unit has a rating up to 30 amp at 250 V a.c. and an approved A.S.T.A. tested rupturing capacity of 3,000 amp at ·75 p.f. 250 V a.c. A thermal-magnetic mechanism protects the circuit in use, the thermal element operating on over-current after a time delay and instantaneous magnetic tripping occurring on short circuit. A narrow width, short overall length and the facility to be wired either from the back or front makes the circuit-breaker suitable for mounting on practically any distribution board. Also produced by the same manufacturers are a number of distribution boards designed to house from one to twelve of these units which may be either flush or surface mounted.



*Dorman and Smith offer the "Loadmaster" in 5 A, 15 A, and 30 A ratings*

## Precision Hole Cutter

DESIGNED for use in both portable and bench type power drills of ½ in. capacity and upwards is novel hole cutter in which the teeth are removable for regrinding or replacement. Supplied by DIXON-LESLEY LTD., 28 St. Mary's Place, Newcastle-on-Tyne, the cutter employs specially ground teeth supported by back pieces mounted in a chuck. The position of the back piece controls the rate of feed which is thus quite independent of the pressure applied. Rakes of both teeth and back support are stated to ensure automatic clearance of swarf during cutting. With the 18% tungsten-cobalt steel employed for the teeth, a hole of 2 in. diameter can be cut in mild and small carbon content steels at 200 r.p.m. without difficulty.

## Toasters for Caterers

OF special appeal to the catering trade comes a range of toasters from ELGA PRODUCTS LTD., Elga Works, Railway Place, Wimbledon, S.W.19, which features unit construction to facilitate extension and maintenance. The toaster is built up to customers' requirements from independent two-slice units permitting additional units to be added if warranted. Since each unit can be operated independently, any one toaster can be taken out for maintenance without affecting the remainder

*Elga's latest toaster can be made up into multiple unit banks*

of the bank, thus affording uninterrupted service. Operation is fully automatic, without preheating, a colour dial permitting infinite variation from a light to dark brown toast. Current saving is said to be considerable, the consumption of the toaster being stated as 75% less than that of the conventional grill. Two- to eight-slice models are standard but larger banks may be built up to requirements. Prices range from £10. 10s.

## Autumn Heating Plans

NEW space-heating appliances in preparation for the coming heating season are announced by a number of manufacturers. Heading the list are BRITISH NATIONAL ELECTRICS LTD., Newarthill, Motherwell, Scotland, who are adding two cheaper convectors to their range. Known as the P.15 models, they are priced at £7. 15s. plus £2. 16s. 10d. p.t., and differ only in finish, one being in black crackle, the other hammered grey, and both having flame gold louvres. They are both 1·5 kW units available for the usual voltages. Their P.20, 2 kW thermostatically-controlled convector, which sells at £11 plus £4. 0s. 6d. p.t., is now available in a hammered grey finish as well as black crackle. Modifications are also seen in the F.101 and F.102 radiant fires which are now fitted with rubber feet and present a new finish in old gold heat-resisting paint. In the latter, moreover, the switch has now been moved to the side and the guard chromium-plated reflector. The F.104 reflector fire now has a chromium-plated reflector, instead of the earlier nickel plate, chromium-plated guard and attractive cream and light brown finish. Selling prices are F.101, £2. 5s. (p.t. 16s.); F.102, £3. 5s. (p.t. £1. 3s. 10d.), and F.104, £3 (p.t. £1. 2s.).

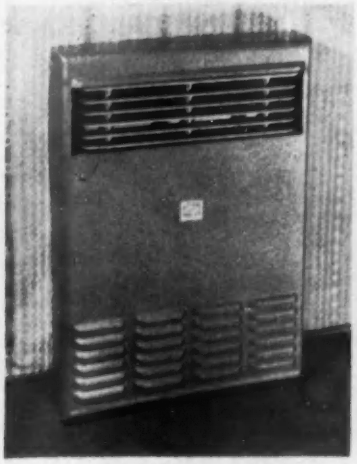
FROM SIEMENS ELECTRIC LAMPS AND SUPPLIES LTD., 38-39 Upper Thames St, E.C.4, comes news of their "Wafer" convector heaters which, previously supplied to the shipbuilding industry, are now available for the general market. Compact in design and neat in appearance, the heaters earn their name from their small depth of only 3 in.; when mounted on wall brackets (a standard supply) the projection is only 5 in. Free standing and back to back models are available.

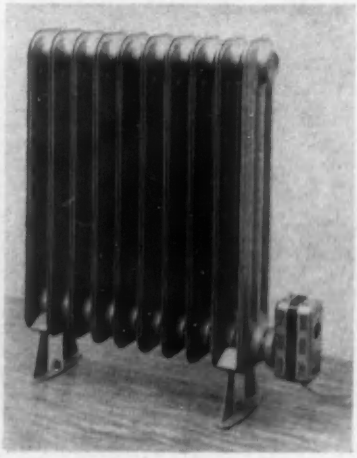
Design is aimed at ensuring infinite life without attention, and retention of some of the stringent requirements demanded for their use in ocean-going vessels makes the unit suitable for office, factory, shop and even home use. Heaters, employing iron-free elements running at black heat, are available in two versions, one having an uncooled outer casing suitable for factories and for mounting in out of reach positions, and the other being a cool outer case type. For the 1 kW size, such heaters have a nominal surface temperature of 110° F. Heaters of 500 W, 1 kW and 1·5 kW rating having a common height and width of 24·5 in. and 17·5 in., can be fitted with internal lamps, switches and half-heat switches, and range in price from £6 to £11, excluding p.t. The 2 kW size is 30·5 in. high and 25·5 in. wide and has list prices from under £8 to £13 (excluding p.t.), the actual price in each case determined by fixing and control requirements.

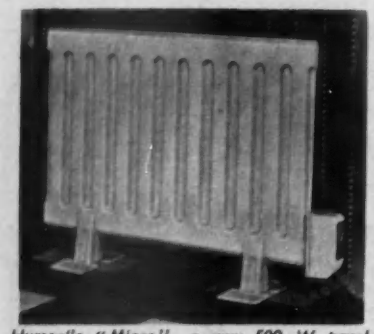
## *For the Electrical Trade*

COMPLETING a range of three models rated at 1 kW, 1·5 kW and 2 kW, is a new 1 kW column-type oil-filled radiator just introducted by DIMPLEX LTD., Totton, Southampton, Hants. Compact in size—its dimensions are 21¼ in. long (including thermostat) by 21 in. high by 5 in. deep—it is ideal for the small house or flat. Its weight of 50 lb presents little difficulty for moving about. Like other radiators in the "Dimplex" range, the newcomer is available finished in bronze, gold, cream, white, silver grey, sky blue, eau-de-nil or pink and hence will harmonise with virtually any colour scheme. The price of the heater is £15. 10s. plus £5. 13s. 3d. p.t. As a standard model, it is available for use on only a.c. supplies, but for d.c. operation an excess temperature cutout is supplied although a room thermostat is available at additional cost.

*Left to right in this array of new heaters for the coming season are seen the unobtrusive Siemens "Wafer" convector, a 1kW column radiator by Dimplex, and B.N.E.'s P.15 low priced convector unit*







*Hurseal's "Minor", a new 500 W panel radiator, is ideal for odd corners*

IDEAL for such odd corners as the breakfast alcove is the new "Minor" electric panel radiator from HURSEAL LTD., 229 Regent St, W.1. It is of the permanently oil-filled type and thermostatic control ensures safety and economy —the surface is always safe to touch. Versions are available with feet or with castors for greater convenience. Having a loading of 0·5 kW, it is 21 in. high (including feet), 29·5 in. long and affords a heating surface of 8·4 sq ft. It sells at £8. 15s. 6d. plus p.t. of £3. 4s. 2d.

MENTION in this feature recently (21 July issue) of the "Memglo" fire and "Circulair" convector, introduced by the MIDLAND ELECTRIC MANUFACTURING CO., LTD., Tyseley, Birmingham 11, is followed now by the publication of M.E.M.'s Fire List No. 361 in which the full range of heating appliances presented for the new season is given. Details of consolidated list prices are also given, these being subject to the usual trade discount. An associated folder, list No. 362, indicates the national advertising programme upon which M.E.M. have embarked; for this reason they advise early ordering, particularly in view of a possible coal shortage. We also wish to point out that the "Memglo" fire was incorrectly described as the "Memolo" in our description of it in the 21 July issue.

## New G.E.C. Tailor's Iron

WHILST generally similar in appearance to their earlier model, a 12 lb tailor's iron produced by the GENERAL ELECTRIC CO., LTD., Magnet Hse, Kingsway, W.C.2, features a new design of terminal box having a flex-supporting spring projecting from the back at 30° to the vertical. Both element and clamp plate extend to the toe of the sole plate, and the asbestos pad covering the sole has been increased to insulate it from the cover. To effect more rapid heating, its element rating has been increased to 650 W, the temperature being maintained during use. Overall finish is nickel plate, apart, of course, from the wood handle. Price of the iron is £4. 1s.

*The new 12 lb tailor's iron introduced by G.E.C. has a nickel plate finish*

## New Grade of "Permanoid" Cable

CLAIMED to be the most flexible grade of p.v.c. insulated and sheathed cable available, comparable in flexibility with any rubber insulated equivalent is a new grade of cable recently introduced by PERMANOID LTD., New Islington, Manchester 4. To obtain this increased flexibility, not only have special grades of p.v.c. compound been used for both insulation and sheath, but a special short lay construction has been employed on the cores together with paddings and wormings of special design. Two basic ranges of the new cable are available, one of which complies with dimensions specified in B.S. 2004, and the other having substandard thicknesses suitable for light power work and portable domestic appliances. Samples, data sheets and prices of the cable are readily available on request.

## Fitting Prices Up

SMALL increases are made in the prices of certain "Atlas" and "Ekco" fluorescent lighting fittings. THORN ELECTRICAL INDUSTRIES LTD. and ECKO-ENSIGN ELECTRIC LTD., were announced last week. Revised prices apply to all orders received on and after 8 August.

# TRADE PUBLICATIONS

DOMESTIC APPLIANCES.—New "Swan Brand" Catalogue No. 78 has been issued by Bulpitt and Sons Ltd., Swansea Works, Birmingham 1.

PLASTICS.—New booklet issued by Monsanto Plastics Ltd., Victoria St, S.W.1, outlines the advantages and availability of "Lustrex" moulding materials.

MILLING.—New Steel-Shaw high output "smalls" department mill (Mark II) is described in a leaflet issued by Steele and Cowleshaw Ltd., Cooper St, Hanley, Stoke-on-Trent.

REFRIGERATORS.—Booklet describing G.E.C. Coldair sealed systems for domestic refrigerator cabinets has been issued by Coldair Ltd., East Lane, Wembley, Middx.

TELEVISION.—Mobile television equipment is described in a new brochure issued by Marconi's Wireless Telegraph Co., Ltd., Chelmsford, Essex.

DISTRIBUTION GEAR.—Leaflet on "Varilectric Distribution Boards" has been published by Varilectric Ltd., 10 Melton Rd, Peckham, S.E.15.

MECHANICAL HANDLING.—Information on trucks and stillage equipment has been received from Consteel Ltd, Haydock, Lancashire.

LIGHTING.—New 40 pp. catalogue in colour describing their latest range of commercial lighting fittings has been issued by Holophane Ltd., Elverton St, S.W.1.

SWITCHGEAR.—Details of the "Standard A" range of switchgear, switchboards and allied equipment has been sent to us by The Scanlan Electric Co. Pty. Ltd., 248-250 Coward St, Mascot, N.S.W.

TELEPHONES.—Details of the private telephone service available from the British Home and Office Telephone Co., Ltd., 73 Great Peter St, S.W.1, are to be found in a recent leaflet issued by the firm.

REFRIGERATORS.—New edition of Broadsheet Z201/1 "Ring up profits with Prestcold Refrigerated Display" has been published by the Pressed Steel Co., Ltd., Cowley, Oxford.

INDICATORS AND RECORDERS.—Leaflets describing units on the "Commander" range of equipment by George Kent Ltd., Luton, include No. 362 KUP flow and pressure recorder, 363, KUX Differential pressure recorder, 364 KOS Flow indicator; 365 Boiler Test indicator; 366 KUE Flow transmitter; 372 KR Receiver recorder; 373 KRX Receiver recorder; 374 KT Temperature recorder.

DOMESTIC APPLIANCES.—The Hotpoint Electric Appliance Co., Ltd., Fletton, Peterborough, has announced a new publication (H502-1) describing their CH/P washer with water heater.

INSTRUMENTS.—Brochure IN126 available from Ferranti Ltd., Hollinwood, Lancs, describes the Ferranti-Shirley Cone and Plate Viscometer, developed in conjunction with the British Cotton Industry Research Association.

REFRIGERATION.—Coldrator division of the Hotpoint Electric Appliance Co., Ltd., have issued a publication covering their service cabinets of 13 and 78 cu ft capacity.

AIR CONDITIONING.—The Precipitation Electrostatic Air Cleaner is described in Publication 7105 issued by the Sturtevant Engineering Co., Ltd., Southern House, Cannon St, E.C.4.

DIESEL ENGINES.—Publication No. 1407 issued by Davey Paxman and Co., Ltd., Colchester, describes in great detail the firm's range of "YH" diesel engines for traction ranging from 200-1,000 b.h.p.

PROTECTIVE PAINTS.—New brochure issued by Allweather Paints Ltd., 36 Great Queen St, W.C.2, describes the "Pitan" range of all-weather protective chlorinated rubber paints and other materials.

FEED WATER EQUIPMENT.—New catalogue recently published (H.54) on Three Element Feedwater control is available from James Gordon and Co., Ltd., Dalston Gdns, Stanmore, Middx.

CABLES AND WIRING.—Three new publications by Enfield Cables Ltd., Victoria Hse, Southampton Row, W.C.1, are a catalogue (EN102) of paper insulated cables. A leaflet (EN208) describing the "grid suspension" wiring harness and (EN 1075) descriptive list of joint box compounds.

# NEW LITERATURE

### *Transient Analysis of Alternating-Current Machinery*

*by W. V. Lyon.*

SYMMETRICAL components have long been an indispensable tool for the analysis of unbalanced operation of polyphase machines and their associated networks, although when applied to machines, steady-state behaviour only has been considered. This volume extends their application to the transient behaviour of machines, developing a systematic method for this purpose. As such, it is an important addition to the technical bookshelf, particularly for engineers and technologists concerned with the design and operation of a.c. machines. The subject is developed from a consideration of static circuits, discussing symmetrical components of instantaneous potentials and currents, obtaining differential equations for the ideal case of cylindrical rotor machines. Transient conditions in induction machines with both stationary and constant speed rotors are then considered, developing the subject to cover uniform air gap machines with rotor excitation at constant speed, salient pole synchronous machines at constant speed, and, finally, induction and synchronous machines at variable speeds. Published by Chapman and Hall, 310 pages, 9 in. by 6 in. Price 56s.

### *Laxton's Builders' Price Book*

AS a reliable guide to the prices of the very wide range of goods used throughout the building trade this annual has proved invaluable in the past. In recent years prices of various commodities have tended to change rather quickly but this has not minimised the value of the publication unduly. In this edition the increased wage rates which came into operation in mid-Apr. are included—an indication of the effort made to keep the information up to date. The volume has, in fact, been revised throughout. The section on electrical work covers a variety of articles ranging from conduit to lightning conductors, but for electrical contractors the publication is of great value in enabling a close estimate to be made of the cost of any associated building work. Included in the strongly-bound volume is a lengthy alphabetical list of trade names and firms. Published by Kelly's Directories, 1,050 pages, 7 in by 4½ in. Price 35s.

### *Garcke's Manual of Electricity Supply*

THERE can be few statistics relating to the Electricity Supply Industry in Gt. Britain which are not contained in this hardy annual that finds a ready place on most reference shelves. The style of presentation, too, remains unchanged, assisting easy access to the information. There is a wealth of data concerning the C.E.A.'s power stations, which is followed by information on the Divisions and the Area Boards. In respect of the latter comparative tables covering several years' operations provide a ready insight into the trend of development. After a section devoted to Scottish, Irish and other electricity undertakings in Gt. Britain, financial and certain information relating to many electrical manufacturing concerns is given, followed by a personal section. The volume is strongly bound to withstand the frequent use to which it is sure to be subjected. Published by Electrical Press Ltd., 888 pages, 8¼ in. by 5¼ in. Price £3. 17s. 6d.

### *Electronic Measuring Instruments*

*by E. H. W. Banner,* MAJOR, R.E.M.E., (A.E.R.), T.D., M.SC., M.I.E.E., M.I.MECH.E., F.INST.P., M.CONS.E.

THERE are few fields in industry which have been left untouched by the advent of electronic instruments which have developed to the extent that the instrument engineer can command an almost limitless variety. His task of selection and application of suitable instruments is made the easier for this valuable survey of the field of electronic measurement, with attention, in particular, devoted to the measurement of very high and very low values, remote indication and accuracy. Although it is a truism to say that no one book could possibly hope to cover such an extensive field, but this is successful in covering the main electronic devices now in use not only for the engineer, but for the user and student. It covers the field in four parts, the first dealing briefly with the characteristics of indicating instruments suitable for use with electronic equipment, the second, with such electronic devices as are used, the third (the bulk of the book) with electronic instruments using these devices, and the fourth with "quasi-electronic" types which although not electronic instruments proper, can fairly be classed under that heading. Published by Chapman and Hall, 395 pages, 8¼ in. by 5¼ in. Price 45s.

### *Applied Electricity*

*by H. Cotton,* M.B.E., D.SC., M.I.E.E.

THE comparatively short interval between the appearance of the second and this third edition reflects the general adoption of the m.k.s. system, and its consequent incorporation in textbooks, since this edition differs only from its forerunner in the use of the m.k.s. system, and the consequent rearrangement of the text. Such a change can only enhance the value of this book which provides the students studying for Part I of the London B.SC.(ENG.) degree or similar examinations with complete coverage of all that is required with the attention to basic principles and important formulae which characterised it from the start. From a careful introductory chapter dealing with units which has not forgotten that past examination employed the c.g.s. system and gives corresponding attention to the relationship between that and the m.k.s. system, the work covers the ground in appropriate style—discussing the electric circuit and associated basic formulae, magnetics, electrostatics, electrolytic conduction and thermo-electricity before considering d.c. machines in greater detail. By and large this concludes the d.c. section, the remainder of the book being concerned with a.c. circuits and machines, and concluding with chapters on electronics, illumination and measuring instruments. Third edition, published by Cleaver-Hume, 488 pages, 8¼ in. by 5¼ in. Price 18s. 6d.

# BOOKS RECEIVED

**The Earnings of Industry,** 1955 edition, provides a concise account of the relation between profits earned by producers and wages, salaries, and costs of materials. Published Hollis and Carter for Aims of Industry Ltd., 79 pages, 8¼ in. by 5¼ in. Price 4s.

**Light Calculations and Measurements,** by H. A. E. Keitz. Practical guide to photometry, for the modern lighting engineer, giving comprehensive data on practical measuring methods. Published for Philips Technical Library by Cleaver-Hume, 411 pages, 9 in. by 6 in. Price 52s. 6d.

**Good Presentation.** Prepared by the 16 mm. Film Division of the British Kinematograph Society, giving recommendations and advice on all matters associated with the presentation of 16 mm films—projectionist training, maintenance of films and equipment and operating conditions and requirements. Published by the British Kinematograph Society, 164 Shaftesbury Ave, W.C.2, 10 pages, 9¼ in. by 7¼ in. Price 1s. 6d.

**The Scope for Electronic Computers in the Office.** Full account of a session on this subject at a recent O.M.A. conference on Office Mechanisation, giving papers by eleven manufacturers of computers. Published by the Office Management Association Ltd., 58 Victoria St, S.W.1, 102 pages, 9¼ in. by 7¼ in. Price 15s.

**Practical Wireless Service Manual,** by F. J. Camm. New edition with considerable new material to be of value also to the television service engineer. Tenth edition, published by Newnes, 284 pages, 8 in. by 5 in. Price 17s. 6d.

**Principles of Electric Utility Engineering,** by C. A. Powel. Concise review of everyday problems facing the engineer in modern American electric utilities. Published by Chapman and Hall, 251 pages, 9 in. by 6 in. Price 48s.

# NEWS OF THE WEEK

## ELECTRICAL INDUSTRY HAS GOOD SHARE OF COMMERCIAL TV ADVERTISING

***Dry Shaver Manufacturers Prominent in Early Bookings***

WITH just six weeks to go before commercial television makes its debut in this country, the electrical industry is assured of at least a fair share of advertising time. Enquiries made last weekend revealed that at least 20 electrical companies have booked time with programme contractors. No information is yet available on the names of the firms concerned nor on what products it is proposed to advertise, but it is understood that nearly all are manufacturers of domestic appliances, and that it will be the larger appliances that receive most attention. As might be expected, few of the prospective TV advertisers are anxious to reveal their intentions, although an exception appears to have been made in the case of electric dry shavers.

Remington's Super 60 shaver will appear at peak viewing time on the first evening (22 Sept.) and then every week, and always at peak times. A varied selection of commercials is planned, we understand. For the first few months, commercial TV transmission will be restricted to the Greater London area, but to compensate for the lack of TV coverage outside London, one minute colour films will be shown in the Sept.-Dec. period in 800 selected cinemas. Eventually, the shavers will have full network coverage. A spokesman for the company told the ELECTRICAL TIMES that planning TV advertising started last October. After numerous experiments, certain types of presentation were eventually evolved. One of the techniques, he said, was completely original but details would have to remain secret until actual appearance.

Philips Electrical have also made arrangements for advertising their Philishave. One-minute spots have been booked at a peak evening viewing time each week, starting "at the commencement of commercial TV." The spots will take the form of a sound film, but no celebrities have been engaged, we understand. Emphasis will be laid on the rotary action of the shaver to link up with current publicity.

Another prominent manufacturer, the Sunbeam Electric Co., Ltd., have budgeted for commercial TV advertising and included it in their advertising appropriation, but to date, we are informed, no time has actually been booked.

Notable absentees during the first year of the Independent Television Authority's operation will be the nationalised fuel industries. The C.E.A.'s decision was announced at the E.D.A. sales conference last April, when it was decided not to participate until results of other advertisers had been assessed.

## Scottish Cable Company decides to Close Down

VOLUNTARY liquidation of Craigpark Electric Cable Co., Ltd., was foreshadowed by the company's directors last week. Founded in the 1890s, Craigpark are one of the oldest cable firms. The present company was registered in 1903. The board recommends the closing down of the factory in Flemington St, Glasgow, as well as branches in Scotland and England. About 400 employees would be affected by such a move, but as there is work on hand to last until October, the cessation could be concluded gradually with a minimum of inconvenience.

Reason for this drastic action was given in an announcement by the board, which stated that with more competitive marketing conditions and rapid progress in manufacturing techniques, the factory had become unsuitable and unadaptable to modern needs. Economic competition would not be possible in the future unless in a new factory with modern equipment. Having assessed the factors involved in the required expansion to meet current needs, the board reluctantly decided that the heavy outlay would not be justified and accordingly recommended voluntary liquidation. The decision, taken now would, the board maintain, avoid progressive deterioration and unnecessary hardship.

## £200m STOCK OFFERED BY THE C.E.A.

IT was announced on Monday that the Central Electricity Authority is issuing £200m 4½% Guaranteed stock, 1967-69, at 98½. Application lists open and close today (Thursday). The issue came as a surprise to the Stock Exchange, for although it was expected to be made in the not too distant future, it was not considered immediate. Primary object of the new loan will be to repay bank advances, which on 30 July, amounted to £153,270,000.

When list opens today, 10% will be payable followed by 40% on 9 Sept., 25% on 31 Oct., and 23½% on 15 Dec. Interest is payable on 11 Feb. and 11 Aug., the first being 30s.% on 11 Feb. next year.

## *NUCLEAR POWER STATION CONTRACTS*

### Civil Construction Works at Calder Hall and Chapelcross

TWO civil engineering contracts were announced last week by Taylor Woodrow in respect of Calder Hall "B" and Chapelcross nuclear power stations, to be built for the Atomic Energy Authority. The Chapelcross station is situated at Annan in Dumfriesshire. Taylor Woodrow have begun preliminary site works there estimated to cost £250,000, and it is planned to have four reactors similar to those at Calder Hall. Consulting engineers for this project are Merz and McLellan.

Construction of the Calder Hall "B" station was announced in the House of Commons last June. It will be adjacent and identical to the original Calder Hall power station. The contract just placed by the A.E.A. with Taylor Woodrow is valued at over £2m and will take 2½ years to complete. Work will include construction of foundations, two 120 ft high reactor buildings with a turbine hall and two-storey administration block. There will also be two cooling towers and all necessary roads and other works.

## *Draft of New Copper Wirebar Contract*

DRAFT of an additional electrolytic copper wirebar contract has been compiled by the London Metal Exchange. It will allow buyers to specify the weight of wirebar required and call for delivery at one of a number of British ports. Inclusion of some Continental ports at a later date is expected. Metal purchased under the contract will be delivered in about 90 days. It is not intended to introduce the new contract immediately, however. The present time is considered "inopportune," but the matter will be kept under constant review, and ample notice given.

The L.M.E. Committee stated last week that they were aware of the widespread interest in the question of open market pricing of electrolytic copper wirebars, and were anxious to establish and publish a quotation which would enhance the Exchange's reputation, and be of use to the trade both at home and abroad. The new contract had been devised only after alternative bases had been fully investigated and found impracticable.

## NEW SCHOLARSHIPS

THE first awards have been made under the scholarship scheme inaugurated by the General Electric Co. about two months ago. Twenty-eight applications were received and three scholarships have been awarded. Mr D. M. Leakey, a graduate apprentice at the Coventry telephone works will undertake research work at the Imperial College of Science and Technology, and Mr D. N. L. La Frenais, a student assistant at the company's research laboratories, is to complete his final year in the degree course in electrical engineering. Finally, Mr L. J. Wilkins, a pupil at the Fraser and Chalmers works, will take a degree course in mechanical engineering at London University.

## OFFICIAL PUBLICATIONS

MINES. Report of H.M. Inspectors of Mines for 1954 of Scottish Div. H.M.S.O. 2s.

OVERSEAS ECONOMIC SURVEY. Australia. (See page 202). H.M.S.O. 7s. 6d.

BRITISH STANDARD. B.S. 1928, 1955: Gramophone Records, Transcription Disk Recordings and Disk Reproducing Equipment; B.S. 37, part 5, 1955: Electricity meters. Polyphase kilowatt maximum demand meters.

STATEMENT OF GUARANTEE, given by Treasury on 13 July in respect of loans proposed by N. of Scotland H.E. Board. H.M.S.O. 2d.

## *B.o.T.'s Census of Production for 1953*

RESULTS of the 1953 Census of Production, which took the form of a sample enquiry have been published in the Board of Trade Journal. Overall, the net value of manufacturing output in the U.K. was 7% higher than when the last Census was taken in 1951. The net output was obtained by deducting from gross output the cost of materials, work given out, etc., and it represents the fund from which salaries, wages, taxes, advertising and other expenses are made. Net output in the electrical engineering industry in 1953 amounted to £214·3m, as compared with £185·4m in 1951. At the same time employment fell from 295,500 to 292,600 in 1953. Capital expenditure rose by £1·6m to £12·6m. In the electric wires and cables industry the net output rose to £40·4m from the 1951 figure of £36·3m. Capital expenditure in this field was £3·5m in 1953 against £2·6m. Employment remained much the same in the cable industry but rose considerably in the radio and telecommunications field from 237,300 to 257,700. Net output rose from £127·1m to £150·2m in 1953, and capital expenditure rose slightly to £7m.

In the electricity supply industry net output rose from the 1951 figure of £185·7m to £234·8m, an increase of £49·1m, as compared with the gas industry's increase of £15·8m to £115·3m. These figures include rents for meters and appliances and net receipts from sale of appliances. Capital expenditure in the electricity industry amounted to £181·5m in 1953, against £150·6m in 1951 and compared with the gas industry's £48·4m and £40·4m respectively.

## Overseas Students entertained

LAST Friday, the English Electric Co., Ltd., acted as host for 136 students from the overseas countries who are studying in this country under the International Association for the Exchange of Students for Technical Experience. At Marconi House, they were introduced by Mr Newby, I.A.E.S.T.E., Secretary, and addressed briefly by Sir Ronald Nesbitt-Hawes, Director of the company's Education Dept.

## A.S.E.E. COMPETITION AND EXAM RESULTS

FIRST prize in the A.S.E.E.'s 26th annual competition for the W. E. Highfield Shield has been won jointly by Mr G. V. McNeill, of Forest Hill (London), and Mr D. H. Taylor, of New Barking. The winners' papers were on "The Servicing of Fluorescent Lighting Fittings," and "Ultrasonics in Industry." They will each hold the shield for six months and receive a cheque for £9. 9s. Awards will be made at the opening meeting of the Association's London session on 18 Oct.

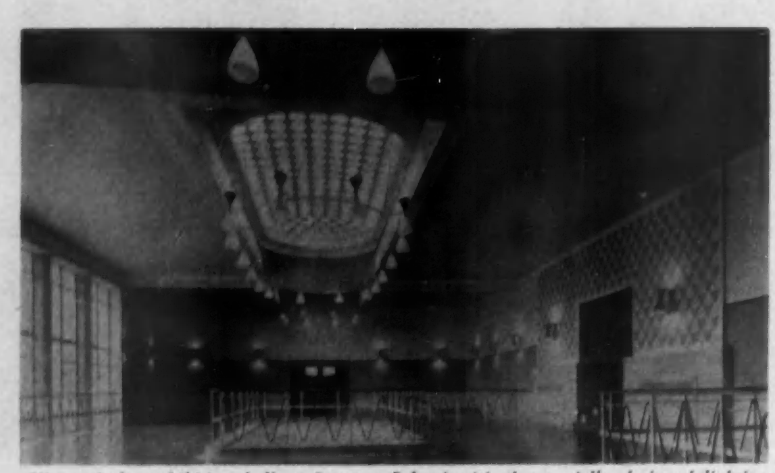
Results of the ninth examination under the A.S.E.E.'s Diploma Scheme have also been announced. The exam took place on 25 May. The Swann Diploma in electrical installations practice has been won by Messrs A. E. Allcock, W. R. Gardner and A. A. Lewis. The technicians certificate in electrical installation work has been awarded to Mr N. B. Heaton. The latter has been made as a result of recent extensions to the Diploma Scheme and this year was the first in which the exam was held. An announcement concerning next year's examination may be expected in November.

## £2½m Generating Plant Orders placed with G.E.C.

THE C.E.A. have placed orders valued at about £2½m for turbo-alternator sets with the General Electric Co., Ltd. The sets comprise one 120 MW and two 60 MW units, in which the alternators will be direct-cooled by hydrogen at 30 p.s.i.g. In this system of cooling, hollow copper conductors are used for the rotor winding through which the hydrogen is forced, thereby greatly improving heat dissipation from the rotor and resulting in a marked reduction in the overall dimensions and weight of the machines. Steam conditions in the reheat cycle turbo-alternator of the 120 MW set will be 1,500 p.s.i.g., 1,000°F., with reheat to 1,000°F. The machine will have h.p., i.p., and l.p. cylinders arranged in a single line, with turbine and generator rotors rigidly coupled and a single thrust bearing. After expansion to 415 p.s.i.a. in the h.p. cylinder, steam passes to the reheat section of the boiler at a temperature of 700°F., and is returned to the i.p. turbine at a pressure of 375 p.s.i.a. and temperature of 1,000°F. After expansion in the I.P. turbine, steam passes through twin overhead pipes to the double-flow low pressure turbine. The rating of the direct-cooled alternator is 150,000 kVA at 0·8 p.f.

The contract includes the supply of a condenser with a cooling surface of 70,000 sq ft, and a six-stage feed heating plant. For an output of 120 MW the designed vacuum will be 28·9 inches of mercury and the final feed temperature 435°F. The two 60 MW sets will operate at steam conditions of 925°F. and 900 p.s.i.g., vacuum at full output being 28·9 inches of mercury. The turbines are a two-casing design similar to those previously supplied to Uskmouth, Ince and Hams Hall stations, and the direct-cooled alternators are rated at 75,000 kVA at 0·8 p.f.

*Windows in the Warrington showrooms of the Merseyside and N. Wales Board recently featured domestic appliances of the English Electric Co. This display was arranged to introduce the company's model 2020 cooker locally*



*View of the exhibition hall at Stratton School with the specially designed lighting fittings by Falk, Stadelmann*

## Electrical Conference for Yorkshire Local Authorities

ABOUT sixty representatives of Yorkshire local authorities recently attended a conference called by the area's Electricity Consultative Council. Freedom of choice between gas and electricity for cooking in new council houses, again received a great deal of attention. Answering one question, Mr D. Bellamy, Y.E.B. chairman, warned that if local authorities did not agree to install a full electricity supply when building houses, it would cost them considerably more to do so later on. He said that millions of pounds were being spent on providing new houses on estates which were further and further removed from the centres of electricity supply. The Board, in addition to having the responsibility to supply electricity when asked, also had the right to charge for the cable and obtain a capital contribution to guarantee a proper return on capital expended.

Mr Bellamy said the Board wanted to waive those rights. It cost only 20% more to put a complete supply in than a lighting supply only. He added that Y.E.B. wanted nothing more than freedom of choice for the individual. If some action by the local authority prejudiced their opportunity they would have to make a charge. What mattered was that the supply was available.

Following the conference of local authorities, it is understood that the question of capital contributions is to be discussed by the Consultative Council next month. Main objections to the Yorkshire Board's demands seem to come from the Doncaster area.

## *Big Electricity Stand at Southport Flower Show*

ONE of the most comprehensive exhibits on the numerous uses of electricity in horticulture is being arranged by the E.D.A., and the Merseyside and N. Wales and N.W. Electricity Boards for the Southport Flower Show. This notable event is to be held this year from 24 to 26 of this month. Main feature of the exhibit staged in the 45 ft commercial glasshouse will be the latest methods of temperature and light controlled propagation of tomato plants. Attention will also be drawn to the practical use of electricity in forestry, use of the electrical fan heater in growing houses, use of electricity in frames, and soil sterilising. Of special note is the prototype truss vibrator, designed by the N.W. Board on the basis of a model used in Holland. Almost everyone in horticulture is sure to find something on the stand which will be of interest to him and help in increasing efficiency.

## Lights Up at Skegness

*We are indebted to the Boston district of the E. Midlands Electricity Board for some notes on this year's illuminations at Skegness. The Council have achieved an impressive display with over a mile of festoon lighting along the promenade and boating lake and the floodlighting of numerous council properties. The Tower Gardens make a pretty picture, especially the fluorescent colour changing system around the fountain, and illuminated flower beds. Incidentally there is a competition in the resort for buildings illuminated by private residents; the competition is divided into several sections for hotels, boarding houses, shops and other smaller buildings*

## Contemporary Fittings for School Hall

A SPECIALLY designed lighting installation in contemporary style has been provided in the exhibition hall at Stratton School, Biggleswade. Bedfordshire's county architect had stipulated that the lighting was to harmonise with the hall in colour and design and was to provide a suitable level of illumination for the various exhibitions to be held there. The architect in charge, Mr H. Hartley, worked closely with the design department of Falk, Stadelmann and Co. to evolve the required scheme. The main fitting is 23 ft long and 9 ft wide, and consists of 16 composite units, each comprising a lower satin opal glass shade and an upper pale green metal reflector. These are mounted on satin and polished brass tubular rings and suspension tubes. This central feature is balanced by two 9 ft diameter matching fittings, and by pale green "diabolo" brackets around the side of the hall. H. A. Cawdell of Luton, carried out the electrical installation.

## *Welsh Electricity Authority —a Foregone Conclusion?*

A SERIES of coloured maps depicting the division of Wales under the existing arrangement of the C.E.A.'s Area Boards and Divisions were displayed at the National Eisteddfod at Pwllheli. Object was to give some publicity to the Welsh plea that they should have their own independent electricity authority in the same way as Scotland. The maps had earlier been submitted to the Herbert Committee as evidence of the Welsh point of view. A note attached to copies of the maps received in this office last weekend stated: "It is a foregone conclusion in Wales that the Herbert Committee is going to advise the Government to grant Wales an independent electricity authority . . ."

## Office Equipment Display

FIRST post-war display to visit Ireland under the auspices of the Office Appliance and Business Equipment Trades' Association, is to be opened at the King's Hall, Belfast, by Lord Glentoran, Minister of Commerce, on 31 Oct. The exhibition will continue until Nov 5.

## INDUSTRIAL CINEMAGAZINE

PRODUCTION of a regular Industrial CineMagazine in which stories of British industry will be carried to important export markets, is to be undertaken by the Central Office of Information. Each issue of the magazine will comprise three or four items, and the firm whose product is featured will bear the cost of filming the story, whilst Government Depts. will pay for copies, foreign language versions and for overseas distribution. Main distribution is to be in the U.S., Latin America, Western Germany and the Commonwealth. The Cine Magazine will be compiled as a series for cinema and TV showing. The scheme was devised by a committee comprising representatives of the F.B.I., Board of Trade and C.O.I.

### *NALGO's 50th BIRTHDAY*

OUR congratulations are due to N.A.L.G.O. who recently celebrated their 50th birthday. In half a century the Association has progressed a long way from that first meeting in Holborn's Inns of Court Hotel when fourteen men met to form the organisation. The Association now has 1,350 branches and a membership of about 230,000. There is a full-time staff of 280 in London and the provinces, as well as almost 10,000 honorary officers. As a trade union, N.A.L.G.O. has the almost unique record of never having had a strike; nor, they claim, have they ever been disrupted by internal strife or breakway movements. Nevertheless they have still improved conditions of members and secured for themselves an influence difficult to rival. Congratulatory messages were sent to the Association by the Minister of Fuel and Power; by Sir Henry Self, deputy chairman (admin.) of the C.E.A.; by Mr E. W. Bussey, chairman, employers' side, Negotiating Bodies in the Electricity Supply Industry, and by Mr H. Norton, general secretary, E.P.E.A.

## The First Half-Century

Latest evidence of activity on the part of the National Electrical Contractors' Association is the conclusion of an agreement with the Cable Manufacturers' Association. Publication of the text is prohibited by a clause in the agreement, but the *Electrical Contractor* states:—"By this arrangement members of the E.C.A. will each individually receive the rebate advantage upon both 'Association' and 'Non-Association' grades of cable just as if he were personally a buyer to the extent of £100,000 p.a. He will also have the advantage of being able to buy his cables where he likes and will not be bound to any particular member of the C.M.A. All this is conditional upon a minimum turnover of £100,000 p.a. for the whole Association with the C.M.A., but there should be no difficulty upon this score, as we understand our members' turnover already approaches that figure."—*From our issue of* 10 *Aug.*, 1905.

*This attractive showcard for counter and window display has been produced by Brook Motors Ltd. as a sales aid for their fractional horse power motors. Coloured in grey, yellow, red and black it measures 16 in. high and 12 in. wide and is available on application to the company's publicity department*

## NEW OBSERVATORY FOR CAMBRIDGE

CAMBRIDGE University have been offered £100,000 over the next ten years to establish an observatory in Cambridge, we hear. The offer has been made by Mullard Ltd. Object of the observatory, which will occupy a new site, will be to extend and continue work on radio astronomy at the Cavendish Laboratory. It is proposed that it be called the Mullard Radio-Astronomy Observatory.

## Fly Ash Agreement

THE whole output of fly ash produced by Battersea power station's pulverised fuel boilers, is to be taken over by Cementation Co. under a new agreement signed by the C.E.A. Some 65,000 tons of ash a year will be converted into a light-weight aggregate under the "Sinterlite" process developed by F. G. Somogyi, consulting engineer. Whilst the arrangement will prove of benefit to the building industry, it will solve the C.E.A.'s problem of disposing of the fly ash. This has involved transportation and dumping on waste land or at sea, which has been both inconvenient and unprofitable.

## NEWS IN BRIEF

An inquiry into C. A. Parsons' proposal to build a light railway over Shields Rd, Newcastle, has been held. It was announced that Newcastle corporation had withdrawn their opposition.

For the first time for many years the Incorporated Society of British Advertisers is holding a conference of advertisers. It will be at Hastings on 7, 8, and 9 Oct. Theme will be "The Advertiser Plans for Tomorrow." Invitations have gone out to about 2,000 firms.

Fair Trade Commission has made Fair Trading Rules for supply and distribution of aluminium hollow-ware which become operative on 1 Sept.

We hear that the Midlands Board want to transfer their administrative offices in London Rd, Gloucester, to a site outside the built-up area. A four-acre site on the Bridge Farm property is being considered.

Huddersfield police have warned householders of a bogus electricity meter reader. A man tried to borrow the key of a house from neighbours on the pretext of reading the meter. The neighbours were aware however, that a uniformed reader had called a few days earlier.

Instrument Society of America is to hold its tenth annual Instrument Automation Conference and Exhibition in Los Angeles from 12 to 16 Sept.

Merseyside and N. Wales area final of the E.I.B.A. National Golf Competition will be played at Heswall Golf Links on 30 Aug. Enquiries to Mr S. R. Gee, 29 Hope St, Liverpool 1.

New clubhouse for employees of Chloride Batteries Ltd., who belong to the Chloride Recreation Club, has been opened at Swinton, Manchester.

Plans have been approved for the erection of area offices and alteration of existing premises at 137 Almada St, Hamilton, for the S. of Scotland Electricity Board.

Turton (Lancs) Urban Council are to ask the Merseyside, N. Wales and N.W. Division of the C.E.A. to repaint the pylons a pale green so that they will harmonise with the countryside better.

A nationwide network of coaxial cable with associated carrier systems to ensure high quality postal services has been inaugurated in Austria by that country's Postal Administration. The main route extends from the Swiss border to Vienna with international extensions to Switzerland, Germany and Italy. Major part in the project was played by Standard Telephones and Cables Ltd.

### *Process Control*

A JOINT conference on Automatic Control in the Process Industries is to be held at Caxton Hall, Westminster, on 4 Oct. It is being organised by the Institution of Chemical Engineers and the Society of Instrument Technology. The conference will cover a number of aspects of automatic control in relation to the design and operation of process plant. There will be a total of nine papers read, although four of these come under the general heading of Automatic Control Applications in Industry. A registration fee will be charged.

# ELECTRIC SUPPLY NEWS

**High Marnham**

For this new power station of the C.E.A., the County Council has decided to ask the Minister of Fuel and Power to require the use of mechanical draught towers in place of natural draught cooling towers.

**Isle of Man**

Allegations that the Isle of Man Electricity Board are not maintaining their overhead lines in a satisfactory manner with the result that excessive interference is being experienced on radio and television receivers, have been made before the Commission now investigating the Island's electricity system under the chairmanship of Sir William Robinson. The Board have indicated that if there is proof of such a nuisance they would rectify it on the recommendation of the Post Office. Radio dealers have complained that the Electricity Board is the only electricity undertaking in the United Kingdom not liable for any nuisance it might cause. Suggestions have been made that future legislation should be designed to conform to English legislation in this matter. The Commission which has been appointed by the Lieutenant-Governor, is to report on the generation, transmission, and distribution of electric current in the Island and make recommendations with a view to achieving adequate supplies at the cheapest price. Members of the Commission have been carrying out a detailed investigation on the spot for several months.

**Lake District**

The Minister of Fuel and Power has now given his consent to the Hartsop electricity scheme in the Patterdale area of the Lake District, which is to be partly by overhead line and partly by underground cable. The North Western Electricity Board expects to start work on the scheme next month. This new line is to start near the village of Patterdale and continue south along the valley. There will be two lengths of underground cable—one of 1,300 yds near Low Hartsop to a point halfway along Brotherswater, and the other of 1,000 yds from the Brotherswater Hotel to Camdalebeck with a spur line to Hartsop Hall. The o.h. line portions are to be sited mostly in the valley bottom and along the edge of woods. Ministerial approval is still awaited for another scheme to supply the adjoining valley of Deepdale, which has already been appointed by the Lake District Planning Board.

**Lincolnshire**

Holland County Council is to draw the attention of the East Midlands Electricity Board—to whom representations have been made about the absence of mains supply over a large part of the Holland Fen area—to the needs of that and other districts of the county as yet without electricity. The Council want the Board to give high priority to schemes for the area. In a letter to the Council, the Board had stated that the area had not been forgotten, but at present they were concentrating on serving the greatest number of consumers within the limits of their authorised expenditure.

**Merionethshire**

There is to be a county conference on 2 Sept. to discuss matters relating to electricity supplies in Merionethshire. Barmouth U.D.C. are seeking the extension of the cable from Trawsfynydd to link up with the cable now serving the coastal areas between Harlech and Barmouth.

**Middlesex**

The plan of the C.E.A. for the erection of the 275 kV transmission line from Elstree, Herts, to Iver, Bucks, would involve the felling of 260 trees and topping of 257 others, at Longmoor Convent and St. John's Convent, Middlesex. This has brought some opposition from the County Council's Estates Committee, who are seeking an alternative route, according to Alderman J. Odle. It seems that originally the line route avoided the council's property and a wayleave was approved for a route across land at Harefield and Denham Court Estate. The committee now considers that the tree clearance is far more extensive than appeared during the wayleave negotiations.

**Trafford Park**

The proposals of the North Western Electricity Board to convert the supply system in this area from d.c. to a.c. is likely to involve certain householders in expense, around which there has been a good deal of misunderstanding. To correct matters, the Board has stated that they proposed to change over the system without any charge to occupiers or owners, and any necessary modifications to appliances will be done free by the Board. In regard to houses owned by the Bradford Property Trust Ltd., however, where the latter have asked for contributions by the householders, the Board points out that these contributions would cover the cost of increasing the capacity of the supply and of providing separate under-the-eaves services on which the Board would be responsible for all future maintenance. This latter would release the householders on the estate from the restrictions of a supply now limited to 550 W, and allow them to use a full range of domestic appliances. The Board also point out that the present method of taking supply to these houses is most unsatisfactory from the occupiers' point of view, because each is responsible for maintaining in good condition cables which not only feed his installation but also that of other houses in his block. The cost of providing under-the-eaves services of adequate capacity would be considerable, and the Bradford Housing Trust agreed to make a contribution towards it. The Board are reviewing the matter to see if an alternative approach can be made.

**Warrington**

Preliminary proposals from the C.E.A. for the Warrington Corporation's participation in a district heating scheme—for the steam plant at the baths—have been rejected by the Town Council. At the recent council meeting, members said they were in favour of such a scheme, but it would be very expensive, and the time was not opportune.

## LIGHTING SCHEMES

**Banstead.** The Council has approved a £36,000 street lighting scheme.

**Brierley Hill.** The Council is to replace sodium lamps at Pensnett and Wordsley with mercury vapour lamps at a cost of £15,000. Other lighting improvements at Thorns Rd, Quarry Bank and Brierley Hill will cost £7,000.

**Corbridge.** The Parish Council is considering a £4,212 scheme for converting gas street lighting to electricity.

**Dudley T.C.** A five-year plan to convert gas street lighting to electricity, at a total cost of £190,000, has been prepared. Expenditure in the first year would be £40,000.

**Leatherhead.** Although a new £17,500 street lighting scheme has received ministerial approval, the Council are to consider an alternative, following objections against the erection of concrete standards along tree-lined roads.

**Southport.** The Lighting Committee has approved schemes to cost £35,310 for improved street lighting, mainly by conversion from gas to electricity.

## *Sayings* OF THE WEEK

*"Television sets should not have priority over refrigerators in installation in boarding houses."* . . . DR W. J. K. KERRIGAN, Medical Officer of Health to Mablethorpe and Sutton U.D.C.

*"Every factory seems to think that staggered hours are a very good thing for everyone except themselves."* . . . MR R. C. MOORE, transport manager, Sheffield Corporation.

*"I should like to enquire whether any ordinary hospitals have ever organised research on the therapeutic value of music, and whether the values of classical music outweigh those of jazz as an aid to recovery."* . . . F. M. BANKS, writing to the *Manchester Guardian*.

# COMPANY ACTIVITIES

SINCE its breakaway from the Brush Group, Associated British Engineering, under the lead of Mr Lawrence W. Robson, has expanded quite impressively. Trading profits for the past year are up £100,000 at £305,000. In the past year British Polar Engine has been brought into the group, the finance being provided partly from internal resources, which earlier had been built up by the sale to Thomas Tilling of its remaining Brush holding. There was also an issue of £300,000 5 p.c. Unsecured Loan Stock. The holding in Parson Engineering Co. has also been increased from 40 p.c. to 98 p.c., by an exchange of shares. In the balance sheet, expansions referred to are reflected in a rise from £1·2 million to £1·6 million in stock and work in progress and from £509,000 to £756,000 in debtors. Properties and plant have gone up from £810,000 to just over £1 million, on book values. As a result of recent developments, the position is being reached once more when the finances are likely to come under some strain. Loans and overdrafts are £37,000 higher at £421,000 while cash is down from £255,000 to £31,000. The shares are a handy size for investment, the 5s. units being 7/10½d. On the increased dividend of 10 p.c. they yield just over 6 p.c. and show an earnings yield of 14·4 p.c.

One of the few companies in this country to give really comprehensive quarterly figures is Catalin, the plastic manufacturers. In addition to the profits it gives the main balance items, while the chairman also comments on trading experience and prospects. Full accounts for the calendar year 1954 are only just out, but because the company has given full information each quarter it is less important than to shareholders who sometimes have to wait many months after the end of a financial year with no information at all. Trading profits are up from £26,800 to £37,600 and the dividend of 5 p.c. is maintained out of earnings of over twice that amount.

A "rights" issue of Ordinary stock is proposed by George Kent, makers of industrial instruments. The issue will take the form of 900,000 new 10s. Ordinary at a price not yet announced. Two years ago some £320,000 was raised in a similar way. Expansion, however, has made the group still dependent on bank finance (which may become difficult) and the group is wise to raise its own money, and thus reduce the net bank overdraft of £329,000. Prospects for the current year look good following an output increase last year of 10 p.c. Outstanding orders have risen considerably for most of the company's main products. The total volume secured during the past year was some £2 millions higher. Dividend has been stepped up from 12½ p.c. to 15 p.c. and the chairman is confident that he will be able to maintain it on the enlarged capital.—*From our City Correspondent.*

**Associated Electrical Industries Ltd.**

The company's offer to acquire £550,000 10% Cumulative preference stock of Siemens Brothers and Co. Ltd., has been accepted by holders of more than 90% of this Siemens preference stock.

The offer (which is of two A.E.I. fully paid 4½% "B" Cumulative preference shares and 5s. in cash in exchange for each £1 unit of 10% Cumulative preference stock of Siemens Brothers) remains open to those stockholders who have not already accepted.

**Sydney S. Bird and Sons**

Of the 325,000 Ordinary shares of 4s. each offered at 4s. 6d. by way of rights, a total of 304,515 were taken up on the provisional allotment letters. For the balance, there were 301,165 applications, which have been trimmed down.

**Elliott Brothers (London) Ltd.**

Of the 312,000 5s. Ordinary shares offered at 20s. each, rights for 307,384 shares were exercised, it is stated. For the 4,616 excess shares, applications totalled 230,040 and these have been trimmed down.

**Globe Telegraph and Trust Co. Ltd.**

The full accounts for the year show that investments at 30 June last amounted to £9,939,070 compared with £8,498,857 twelve months earlier, although there are unquoted investments valued at £2,379,844 which the directors consider is substantially less than their true value. During the year the single-class Ordinary capital was increased to £5 millions by a "rights" issue of £1,117,799.

**George Kent Ltd.**

In view of the continued expansion of trade, it is proposed to make a "rights" issue of Ordinary stock, subject to C.I.C. consent. It is proposed to raise the authorised capital to £1,400,000 by 900,000 new 10s. Ordinary shares forming a single class with the existing £500,000 Ordinary, of which £480,000 is at present issued. The prospects justify the Board's expectation of earning profits sufficient to maintain the current rate of dividend on the enlarged capital, Commander P. W. Kent, the chairman, has stated.

**Marryat and Scott Ltd.**

In the table accompanying our notes on the activities of this concern, in our 14 July issue, an unfortunate error occurred. The net profit for the years 1954 and 1955 should have been given as £49,140 and £68,508 respectively.

**Oldham and Sons Ltd.**

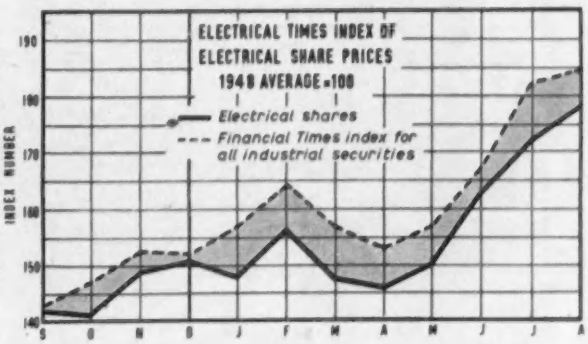
In this, the company's 90th year, the group has been able to report record results with profits totalling £452,958 subject to taxation. Production for the home market and by the factories in South Africa, France and Australia, continued to increase, Mr John Oldham, the chairman, reports. The volume of direct exports during the year ended 31 Mar. last was slightly in excess of that for last year—which can be considered satisfactory in view of the dislocating effects of the dock strike, combined with severe and increasing world competition. At home, the problem is to increase production in face of a continuing shortage of labour, while at the same time providing full-time technical personnel for the overseas companies. Mr Oldham considers the latter requirement the most difficult to fulfil, for the demand exceeds the supply. But he looks forward with confidence to continued progress. It is proposed to make an issue of 2 million Ordinary 1s. shares, fully paid, to Ordinary shareholders, on a one-for-four basis, for which Treasury consent has been obtained. For this purpose £100,000 will be capitalised from reserves.

**Radio and Television Trust**

The offer by Crompton Parkinson Ltd. to purchase the Sinking Fund Certificates and Preference stock of this concern from existing holders has been accepted by more than 79% of the Sinking Fund Certificates and over 88% of the Preference stock which were subject to the offer.

**Dividend Declared**

*R. B. Pullin and Co., Ltd.*, Interim of 5% (*same*).




*Although a number of electrical share prices fell towards the end of July, overall the upward trend continued and the final "Electrical Times" index at 177·7 showed a 5·9 rise in the month. "The Financial Times" index for all industrial shares also rose, but not quite so much, from 182·2·8 to 184*

# COMMERCIAL INFORMATION

## Contracts Open at Home . . .

*Dates given are the final for receipt of tenders unless otherwise stated.*

**12 Aug.—Liverpool T.C.** Domestic electrical goods for Children's Home.—See 28 July issue.

**15 Aug.—Carlisle T.C.** Installation at Harraby secondary modern school.—See 28 July issue.

**15 Aug.—Rochdale T.C.** Installation at Technical School in Nelson St.—See 28 July issue.

**17 Aug.—N. Ireland.** Electrical installation in extension at Lurgan College. A. W. Gordon Holt, consulting engineer, 7a South Parade, Belfast. Deposit £5. 5s.

**17 Aug.—Scunthorpe T.C.** Concrete columns, sodium and mercury discharge lanterns, etc., for street lighting improvements.—Advertised in 4 Aug. issue.

**19 Aug.—Co. Down.** Electrical installation in boys' intermediate school, Armagh Rd, Newry. Varming and Mulcahy, consulting engineers, 37 Malone Rd, Belfast. Deposit £3. 3s.

**19 Aug.—East Ham B.C.** Street lighting equipment for Little Ilford Lane, Church Rd, Browning Rd and Gladstone Ave, involving concrete columns with lamps, lanterns and ancillary gear.—See 21 July issue.

**19 Aug.—N. Ireland.** Various electrical accessories, in year from 1 Oct.—See 28 July issue.

**19 Aug.—Litherland U.D.C.** Conversion of 523 gas street lights to electricity.—Advertised in 4 Aug. issue.

**19 Aug.—Midlothian.** 263 mercury fluorescent lamps on steel columns at Newtongrange-Easthouses-Gowkshill. Also 20 sodium lamps on concrete columns at Newtongrange.—See 4 Aug. issue.

**19 Aug.—Surbiton T.C.** Street lighting comprising sodium vapour discharge lamps on concrete columns along Kingston By-Pass.—See 28 July issue.

**20 Aug.—Arnold U.D.C.** Concrete columns for street lighting in Breck Hill Rd.—See 4 Aug. issue.

**20 Aug.—Penge U.D.C.** Group A and B concrete columns, with lanterns, etc.—See 28 July issue.

**20 Aug.—Whitefield U.D.C.** Supply and erection of 41 Group A concrete columns, sodium discharge lamps, lanterns, etc., for street lighting along Higher Lane and Ringley Rd. Engineer and Surveyor, Town Hall. Deposit £2. 2s.

**23 Aug.—Liverpool T.C.** Electrical installation at Heygreen Rd C.P. school; and improvements to installation at St. James' secondary modern school. Separate contracts. City Engineer and Surveyor, Municipal Buildings.

**24 Aug.—Carlow (Eire) U.D.C.** Duplicate electrically driven pumping plant near Sion Cross.—See 28 July issue.

**25 Aug.—Dublin.** Installation at Iveagh Hse, St. Stephen's Green.—See 4 Aug. issue.

**26 Aug.—Aylesbury T.C.** Electrical installation in 100 houses on Gatehouse estate. Borough Engineer, "Friarscroft," 3 Oxford Rd.

**26 Aug.—Belfast T.C.** Automatic fire fighting installation and medium voltage substation distribution board.—Advertised in 4 Aug. issue.

**27 Aug.—Caerphilly U.D.C.** Supply, erection, etc., of 53 Group A lighting standards with 140 W sodium lamps and lanterns along A472 and B4255 at Nelson. Engineer and Surveyor, Council Offices, Mountain Rd.

**27 Aug.—Preston R.D.C.** Class A and B street lighting schemes on Liverpool Rd, Leyland Rd, and along three lanes, and conversion scheme along side roads, in parish of Penwortham.—Advertised in 4 Aug. issue.

**27 Aug.—Reigate T.C.** Street lighting equipment on Reigate-Hockwood Rd and London-Castlefield Rd.—Advertised in 4 Aug. issue.

**27 Aug.—Wrexham R.D.C.** Installations in 97 houses and bungalows on five sites.—See 4 Aug. issue.

**29 Aug.—Derby T.C.** Supply of 65 140 W sodium discharge lighting units for class A street lighting along A.5111 trunk road. Borough Engineer and Surveyor, Council Hse, Corporation St.—Advertised in this issue.

**29 Aug.—East Riding.** Electrical installation at county secondary school at Pocklington. Apply by above date to Architect, J. H. Napper, 56 Eldon Place, Newcastle.

**29 Aug.—Preston.** Street lighting equipment for Class A scheme in Blackpool Rd, Lea, and Class B scheme.—Advertised in 28 July issue.

**30 Aug.—Basingstoke (Hants).** Lamps to Park Prewett Hospital in year from 1 Oct.—See 4 Aug. issue.

**31 Aug.—Seaham U.D.C.** Materials for maintenance of 3,600 houses for one year.—See 4 Aug. issue.

**1 Sept.—Batley (Yorks).** Rewiring at Batley General Hospital.—See 4 Aug. issue.

**1 Sept.—Friern Barnet U.D.C.** Supply of 41 lanterns, etc., for 140 W sodium lighting and supply and erection of 41 Group A concrete columns and dismantling steel columns on N. Circular Rd. E. H. Start, Engineer and Surveyor, Town Hall, N.11.

**1 Sept.—Co. Limerick.** Electrical installation in Courtenay Boys' national school. J. Tyrrell, secretary, Office of Public Works, Dublin. Deposit £1.

**1 Sept.—New Windsor T.C.** Installation in reconstruction work at Alma Rd Depot.—See 4 Aug. issue.

**2 Sept.—Stranraer T.C.** Supply and erection of 76 250 W mercury vapour Class A street lighting lanterns, control gear, steel columns, etc. Burgh Surveyor, Dunbae Hse.

**2 Sept.—Sunderland T.C.** Electrical installation at Castle View primary junior schools. Borough Architect, Grange Hse, Stockton Rd. Deposit £2. 2s.

**3 Sept.—Failsworth U.D.C.** Supply and erection of 103 group B columns, 16 sodium and 87 tungsten lamps, etc., for street lighting. Engineer and Surveyor, Town Hall. Deposit £2. 2s.

**5 Sept.—Carlisle T.C.** Electrical installation in 252 dwellings. City Surveyor, 18 Fisher St.

**5 Sept.—Cheltenham T.C.** Group A sodium discharge lighting along Bath to Lincoln trunk road.—Advertised in 4 Aug. issue.

**5 Sept.—Heckmondwike U.D.C.** Electrical installation in 10 houses on Dale Lane estate. Council's Surveyor, Oldfield Lane. Deposit £2. 2s.

**5 Sept.—Kincardine.** Electrical installation in 50 houses at Portlethen Station. County Architect and Planning Surveyor's Office, 34 Market Sq, Stonehaven.

**5 Sept.—West Hartlepool T.C.** Electrical installation in 114 three-storey flats on Owton Manor estate. Borough Architect, Municipal Buildings.

**7 Sept.—Kingussie (Inverness) T.C.** Steel columns, lanterns, lamps, etc., for sodium lighting along A.9.—See 28 July issue.

**9 Sept.—Belfast T.C.** Extensions to and modifications on existing Reyrolle switchboards at six substations; and five outdoor transformers.—Advertised in 21 July issue.

**9 Sept.—Edinburgh T.C.** Electrical Installation in 68 houses in Coniston area No. 10, and 26 houses in Loaning Rd. City Architect, City Chambers.

## Your Queries Answered

*Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries*

***A Selection from the 122 queries answered this week***

**Electric frying pans,** makers of? D.E.—Sunbeam Electric Ltd., 14/16 Old Quebec St, W.1; S. I. Engel, 23/25 Kensington Park Rd, W.11; Dowsing Co. (Electrical Mnfrs.) Ltd., Kangley Bridge Rd, S.E.26.

**Kettles, 12 V, for use off a car battery,** makers of? E.B.—Conway Heater Co., 34 Conway Ave, Birmingham 32; Morris Ltd., Cumberland St, Birmingham; Filtrite Ltd., 91/97 London Rd, Manchester 1.

**"Lassovic" adhesive plastic tape,** makers of? S.E.B.—Herts Pharmaceuticals Ltd., Bessemer Rd, Welwyn Gdn City, Herts.

**Stripping machine for enamel-coated wire,** makers of? M.I.—Wallis Eng. Co., 662 Warwick Rd, Solihull, Warwick.

**"Skilsander" tools,** suppliers of? E.C.—British Equipment Co., Ltd., Ixworth Hse, Ixworth Place, S.W.3.

**"Browleco Minor" soldering iron,** makers of? T.B.—Browning's Electric Co., Ltd., Boleyn Castle Green St, E.13.

**14 Sept.—Tunbridge Wells T.C.** Supply and installation of 45 concrete street lighting columns in Class B with lanterns, etc., for Sherwood estate extension, Liptraps Lane and industrial estate. Borough Surveyor and Water Engineer, Town Hall. Deposit £1. 1s.

**17 Sept.—Bebington T.C.** Provision of automatic private telephone exchange and ancillary equipment in first stage of new town hall. G. Chappell, town clerk, Municipal Offices.

**19 Sept.—Waterford (Eire).** Installation at Central Technical Inst., Parnell St.—See 28 July issue.

**22 Sept.—Belfast T.C.** Supply, erection, etc., of a 10-ton overhead travelling crane and two electric hoist blocks of 5-ton and 5-cwt capacity resp. for Power Station West extension. Tender No. N.1712. Merz and McLellan, consulting engineers, Carliol Hse, Newcastle-on-Tyne. Deposit £5. 5s.—Advertised in this issue.

**26 Sept.—Newcastle-on-Tyne.** Supply and erection at Albert Edward Dock, North Shields, of two 6-ton semi-portal electric cargo cranes for Tyne Commission Quay extension. J. K. McKendrick, gen. manager and secretary, Tyne Improvement Commission, Berwick St. Deposit £5. 5s.

**1 Oct.—Islington B.C.** Rewiring of the Council's Public Baths, Greenman St.—Advertised 14 July issue.

**No date stated.—Calne T.C.** Concrete columns, brackets and poles, lanterns, etc., for replacement of gas street lighting by electricity.—See 4 Aug. issue.

**No date stated—Scarborough.** Electrical work in renovation at St. Hilda's Hospital, Whitby.—See 4 Aug. issue.

**No date stated—N. of Scotland H.E. Board.** Lighting and heating installation at Glascarnoch power station.—Advertised in 4 Aug. issue.

**No date stated.—N. of Scotland H.E. Board.** 33 kV switchgear and ancillary equipment for Dounreay substation.—Advertised in 4 Aug. issue.

## . . . and Overseas

*Details of items marked • may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

**25 Aug.—India.** Supply of transformers and switchgear to various specifications for Thippagondanahalli power station. Enquiry No. 13496. Secretary, Stores Purchase Committee, Govt. of Mysore, Kempegowda Rd, Bangalore. B.o.T. (Ref.: ESB 16263/55).•

**26 Aug.—South Africa.** Stores Dept. of S. African Railways at Johannesburg invite tenders (C.5130) for supply of 68,300 lb hard drawn copper wire. B.o.T. (Ref.: ESB 15937/55).•

**26 Aug.—South Africa.** Tenders (No. C.5117) invited for supply of 159 flameproof fluorescent outdoor lighting fittings for Island View 6 and Wharf at Durban Harbour. Stores Dept., S. African Railways, Johannesburg. B.o.T. (Ref.: ESB 15938/55).•

**31 Aug.—New Zealand.** Supply of 200 25 amp and 100 10 amp 400/230 V 50 cycle 3-phase 4-wire unbalanced load watthour meters for Electricity Dept. of Wellington city council. Contract 612. B.o.T. (Ref.: ESB 16073/55).•

**1 Sept.—Australia.** Sydney County Council invite tenders (contract 1910) for supply of 11,000 V 3-phase metal-clad oil-immersed duplicate busbar switchgear with rupturing capacity rating of 250 MVA for Five Dock substation. B.o.T. (Ref.: ESB 16209/55).•

## PRICES of cable metals and other materials

***Figures quoted are the official prices ruling on Tuesday, 9 August***

| | £ per ton | Weekly change £ | Price last year £ |
|---|---|---|---|
| COPPER, standard class A (settlement) | 361 | +1 | 234½ |
| ,, (3 months) | 356 | +4 | 233¾ |
| R.T.S. (Rhodesian Selection Trust) group price* | 325 | — | — |
| LEAD, refined pig, min. 99·97% purity (cash) | 106½ | −1¾ | 96½ |
| ,, (3 months) | 105¼ | −1¾ | 94 |
| TIN, refined, min. 99·75% purity (settlement) | 754 | −7 | 727 |
| ,, (3 months) | 748½ | −5¼ | 726 |
| ALUMINIUM, ingots 99·99-5% | 171 | — | 156 |
| ZINC, virgin, min. 98% purity (cash) | 90½ | −¼ | 74½ |
| ,, (3 months) | 90½ | −¼ | 74¾ |
| RUBBER No. 1, RSS. spot (per lb.) | 43½d. | +2½d. | 20½d. |
| ,, c.i.f. basis, ports. Sept. (per lb.) | 43d. | +2½d. | 19½d. |
| ARMOURING : | | | |
| Galv. Steel Wire (0·104 in.) | 56¾ | +2½ | 52 |
| Mild Steel Tape (0·014 in.) | 43¼ | +2 | 40½ |

(*Fixed price c.i.f. U.K., operative till end of August and then subject to change at 24 hours' notice, to "consumers willing to instil a degree of stability into the resale price.")

## Contracts Placed

**C.E.A.** Two generator transformers at Belvedere, Hackbridge and Hewittic Electric Co., Ltd.; Three 60,000 kW turbo-generators at Rugeley A, C. A. Parsons and Co., Ltd., four 550,000 lb/hr boilers at same, Babcock and Wilcox Ltd., and two condensing and feed heating plants at same, Hick, Hargreaves Co., Ltd.; One 120,000 kW turbo-generator, condensing and feed heating plant at Agecroft B, Metropolitan-Vickers Electrical Co., Ltd., and two 860,000 lb/hr boilers at same, International Combustion Ltd.; Four 860,000 lb/hr boilers at Blyth A, Babcock and Wilcox, Ltd.; 275 kV switchgear at W. Weybridge substation, A. Reyrolle and Co., Ltd.; 132 kV switchgear at Marchwood substation, British Thomson-Houston Ltd.; Two 60 MVA transformers at Pyestock substation. Metropolitan-Vickers Electrical Co., Ltd.; Two 45 MVA transformers at Velmore substation, Fuller Electrical and Manufacturing Co., Ltd.; 132 kV switchgear at Rayleigh substation, A. Reyrolle and Co., Ltd.; 132 kV switchgear at Chadderton substation, Metropolitan-Vickers Electrical Co., Ltd.; 132 kV switchgear at Ipswich (Cliff Quay) substation, Metropolitan-Vickers Electrical Co., Ltd.; 132 kV switchgear at Hams Hall B and C substation, A. Reyrolle and Co., Ltd.; 132 kV switchgear at Capenhurst substation, English Electrical Co., Ltd.; and 132 kV overhead line from Carmarthen Bay to Trostre Tee, Riley and Neate, Ltd.

**5 Sept.—India.** Manufacture, supply, erection, etc., of transformers, switchgear and other auxiliary equipment for extension of Verka substation. Documents at Rs 17 from Chief Engineer, Punjab P.W.D., Electricity Branch, Verka, Amritsar. B.o.T. (Ref.: ESB 16344/55).•

**8 Sept.—New Zealand.** Supply of constant voltage type transformers, input 190-250 V, output 230 V at 50 c/s. Contract No. P. and T. 150/7855. Director General (Stores Div.), G.P.O., Wellington. B.o.T. (Ref.: ESB 16072/55).•

**13 Sept.—Australia.** Director of Posts and Telegraphs, Melbourne, requires supply of power rectifiers of varying capacities. Documents (PMG Schedule No. C.7303) from Chief Procurement Officer, Commonwealth of Australia, Australia Hse, Strand, London, W.C.2.

**7 Oct.—India.** Manufacture, erection, etc., of two hydro-electric generating sets, each consisting of vertical reaction turbine coupled to alternator, and allied indoor switchgear with all accessories for Machkund power station under second stage extensions. Specif. A.193. Superintending Engineer, Technical (Electrical), Andhra Electricity Dept., 20 Rutland Gate, Madras 6. B.o.T. (Ref.: ESB 16308/55).•

**No date stated—Mauritius.** Supply to Central Elect. Board of oil circuit-breakers, transformers, etc., for 22/6·6 kV switching station. Documents from Crown Agents, 4 Millbank, London, S.W.1, quoting ref.: EM1/Mauritius C.E.B. 5.—Advertised in this issue.

## Trade Notes

**New Tel. numbers.** As from next Monday 15 Aug.) telephone number of B.I.C.C.'s London branch sales office at 10-14 White Lion St, N.1, will be Terminus 2701. The telephone No. of Solartron Electronic Group has been changed to Emberbrook 5522.

**Agreement.** Heenan and Froude Ltd., and Marley Co., of Kansas, have entered into an agreement for production of Heenan-Marley water coolers. The British company, as exclusive licensees, will make coolers for nearly all countries outside the Americas.

**Change of Address.** As from 22 Aug. the address of the Council of Industrial Design will be 28 Haymarket, S.W.1. Telephone, Trafalgar 8000.

Head Office of Mond Nickel Co., Ltd., is now at Thames Hse, Millbank, S.W.1.

**Agency.** The Merchandising Division of the Solartron Electronic Group Ltd., has been appointed agent for the Consolidated Engineering Corpn., Pasadena, California, U.S.A., and associated companies, for the U.K., Eire, and certain parts of the British Commonwealth.

**New Branch.** The Skefko Ball Bearing Co., Ltd., have opened a new branch office at Waterloo Buildings, London Rd, Southampton. Telephone No. Southampton 27313/4. The manager is Mr L. E. Wilson.

**Factory acquired.** B. O. Morris Ltd. have acquired a freehold factory in Portsmouth covering approx. 44,000 sq ft, where special purpose machine tools on long term contract for the U.K. Atomic Energy Authority will be rebuilt and designed.

# BUSINESS PROSPECTS

## Home

**Alloa T.C.** Dean of Guild Court has approved erection of 258 houses in Inglewood, and ten houses in Forbes St, and Park Place.

**Ainwick U.D.C.** Construction of 64 houses on Greensfield estate. Surveyor is G. Beaty.

**Co. Armagh.** Erection of new county intermediate schools and other buildings in Toberhewney Lane, Lurgan. W. R. Thornton, architect, 9 Beresford Row, The Mall, Armagh.

**Banffshire.** Scottish Industrial Estates Ltd. are planning erection of factory at Buckie. Architects are Alexander Marshall, Mackenzie and Sons, Bon-Accord Sq, Great Western Rd, Aberdeen.

**Barrow-on-Soar (Leic) R.D.C.** Sixteen council houses and 50 houses for War Office employees at Beaumanor.

**Basingstoke (Hants).** Sketch plans prepared for Robert May's county secondary school at Odiham.

**Bath T.C.** Plans approved for 94 flats and maisonnettes, shops, etc., in Kingmead redevelopment scheme.

**Boston (Linca).** Fire station, headquarters, stores and six houses to be built at cost of £60,000.

**Brighton T.C.** Construction of 68 houses at N. Woodingdean. Borough Engineer and Surveyor, 26-30 King's Rd.

**Dagenham.** New factory to be built on Hainault industrial estate for V. W. Eves and Co., Ltd., 9 Railway Approach, S.E.1.

**Ealing T.C.** Tenders may soon be invited for erection of 36 flats on Fairview estate. Scheme in hand for 26 old people's bungalows on Dibden Hse site.

**Hampshire.** It is proposed to install electric lifts at Ashurst Lodge, Ashurst, and Kitnocks Hse, Curdridge, at costs of £1,050 and £900 resp.

**Hendon T.C.** Erection of block of 15 dwellings at Holders Hill Circus. Borough Engineer and Surveyor, Town Hall, N.W.4.

**Inverness.** Dean of Guild Court approved plans for factory on Longman industrial estate for Scottish Industrial Estates Ltd., Glasgow. Factory to be leased to J. A. Dixon Ltd., Forest Side, Newport, I.o.W.

**Leicester T.C.** Plans in hand for £37,500 special school in Glenfield Rd.

**Leyland U.D.C.** Erection of 24 flats on Lower House estate. F. D. Howe, Engineer and Surveyor, Council Offices.

**Manchester T.C.** Application to be made to borrow £174,205 for erection of Barlow Hall secondary school, and £147,802 for extension and improvements at Didsbury training college.

**Newcastle-on-Tyne T.C.** Sketch plans prepared for primary school on N. Kenton estate by City Architect, G. Kenyon, 18 Cloth Market.

**Northallerton U.D.C.** Erection of 18 houses in Bullamoor Rd. P. Hartley, clerk of council, The Friarage, 72 High St.

**Paisley T.C.** Construction of 83 houses and 16 shops in George St-Canal St redevelopment area. Burgh Engineer, 14 Gilmour St.

**Pontypridd.** Erection of Methodist church in Poplar Rd, Rhdyfelin. Haydn, M. R., and H. W. David Burgess, 30 Mill St.

**Pudsey T.C.** Erection of block of 18 flats in Richardshaw Lane. Borough Surveyor, Town Hall.

**Rotherham T.C.** Extensions, estimated to cost £150,000, to technical college, have been included in 1956-57 educational building programme.

**St Neots U.D.C.** It is proposed to install electric water heaters in 50 council houses at cost of £36 per house.

**Shipley U.D.C.** Permission received to borrow £12,000 for installation of power points in council houses.

**Wembley.** Improvement of lighting installation at county school recommended. Estimated cost is £1,200.

**York T.C.** Erection of 42 dwellings in Thanet Rd and North Lane. E. Firth, City Architect, 8 St. Leonard's Place.

## Overseas

**Germany.** Walter Heise and Co., GmbH, Duisburg, Am Buchenbaum 20a, wish to contact U.K. manufacturers of screw-in type electric lamps.

**Hong Kong.** Blair and Co., Ltd., Windsor Hse, Hong Kong, are interested in hearing from U.K. manufacturers of squirrel caged and/or slip-ring type induction motors from 1 h.p. to 200 h.p., and various types of electric wires and cables, wishing to be represented in Hong Kong.

**India.** Representation of U.K. manufacturer of l.t. and s.t. switchgear up to 100 kVA sought by Turner, Hoare and Co. Ltd., Gateway Building, Apollo Bunder, Bombay, 1.

**Lebanon.** Egyptian and Lebanese Trading Union, B.P.1180, Imm. Fattal, Rue du Port, Beirut, want to represent U.K. makers of telephone and radio telephone equipment.

## NEW COMPANIES

*Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.*

**A. J. Davies (Bromley) Ltd.,** 88 Plaistow Lane, Bromley, Kent. Electricians, radio and electrical engineers, etc. Nom. cap.: £600. Dirs.: H. F. Edwards and R. L. Priscell.

**J. R. D. Electrics Ltd,** Nom. cap.: £10,000. Dirs.: C. W. Juby, 634 Foxhall Rd, Ipswich; W. J. Reeve, 26 Tomline Rd, Felixstowe; and L. Dexter, 4 Cliff Hse, Cobbold Rd, Felixstowe.

**L. T. Hall Ltd.,** 110 Goldhawk Rd, W.12. Electrical contractors, etc. Nom. cap.: £5,000. Permanent directors: L. T. Hall, C. S. Hall, and Mrs M. Hall.

**Jaques Barnard Ltd.** 2 Young St, Doncaster. Electronic engineers and contractors, etc. Nom. cap.: £1,000. Dirs.: T. Jaques, and J. R. Barnard.

*Co. incorp. outside G.B. which has established place of business within G.B.*

**Kenya Power Co., Ltd.** Brit. add: 66 Queen St, E.C.4. Registered in Kenya Colony on Feb. 1, 1954, to carry on business of generators, storers, distributors and suppliers and sellers of electrical energy, etc. Capital: 2,000 shillings. Name of person authorised to accept service: H. C. Trenoweth, 66 Queen St, E.C.4.

## TRADE MARKS

*This information is extracted from the Official Journal by permission of the Controller.*

**Audist.** 736,538. Class 10. Hearing aids. E. Shipton and Co., Ltd., Ferndown, Northwood Hills, Middx.

**Brezblo,** in design, 733,095. Class 11. Ventilating fans. W. D. Head and Co., Birchwood Ave, Wallington, Surrey.

**Promoter.** 742,556. Class 11. Refrigerators. Pressed Steel Co., Ltd., Cowley, Oxford.

## Gazette Announcements

### COMPANIES ACTS

**Bloor Industries Ltd.** Last day for receiving proofs in respect of intended dividends, 19 Aug. Liquidator is R. F. Bendall, 31 Lloyd St, Manchester.

**R. H. Boyland and Co., Ltd.** Liquidator, D. Morgan of 100 Park St, London, W.1, released as from 9 July.

**Stamford Electrical Ltd.** Liquidator, F. M. Collins, Official Receiver, Inveresk Hse, 346 Strand, W.C.2, released as from 19 July.

**Eclipse Products (London) Ltd.** Last day for receiving proofs in respect of intended dividends, 23 Aug. Liquidator is L. S. Findlay, 4 Charterhouse Sq, London, E.C.1.

**Chadfield's Inventions Ltd.** Resolution for voluntary winding-up passed at meeting on 3 Aug. R. A. Haigh, C.A., Court Chambers, Friar Lane, Leicester, has been appointed liquidator, and creditors are asked to send particulars to him by 14 Sept.

*Partnership Dissolved*

**Rad-Electric.** Partnership between Arthur J. Cherry, Joseph R. Price and Alfred E. Ball, trading under above name at 18 Shelford Rd, Radcliffe-on-Trent, dissolved as from 1 Mar, as far as concerns A. J. Cherry, who retires.

### BANKRUPTCY ACTS

*Receiving Order*

**Birmingham.** Cecil A. Smith, trading as Birmingham Electrical Co. at 4 Gothic Arcade, Snow Hill. Date of receiving order, 25 July.

*Applic. to Review Order on Discharge*

**Ashton-under-Lyne.** Ewart B. Page, electrical engineer trading at 10 and 12 John St, Hyde. Hearing fixed for tomorrow (12 Aug.) at Town Hall, Ashton-under-Lyne, at 10.30 a.m.

*Order Rescinding Order*

**Stockport.** John S. Morris, electrical contractor of 295 Stockport Rd, Cheadle Heath. Receiving order dated 4 Apr. rescinded, and petition filed on 15 Mar. dismissed. Date of rescission 18 July. Grounds named: Provision made for payment of unsecured debts in full, except for one claim unconditionally withdrawn, and for payment of all costs of and incidental to proceedings.

*Application for Discharge*

**Kingston-on-Thames.** Geoffrey W. Altass, electrical engineer trading at 16 St. Phillips Ave, Worcester Park. Hearing fixed for 10.30 a.m. on 11 Oct. at The Guildhall, Kingston.

*Appointment of Trustee*

**London.** William H. McCall, refrigeration engineer, of 10 Brockley Ave, Stanmore, Middx. Trustee is D. Mahony, incorp. acc., 3 Great Winchester St, E.C.2.

*Intended Dividends*

**Leeds.** Samuel Whilton and Leslie Whilton, trading as F. Whilton and Sons, electrical enginers, at Church Place, Victoria Rd, Leeds. Last day for receiving proofs, 20 Aug. Trustee is R. B. Smith, 34 Kent Rd, Harrogate.

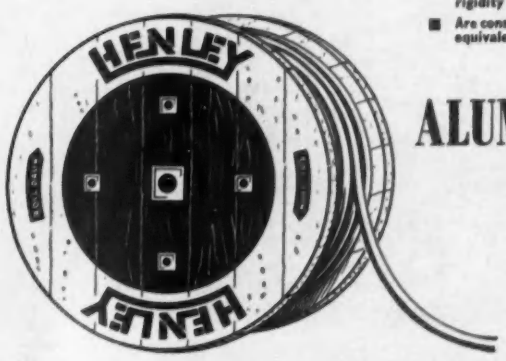
# "Light as Glass

. . . white and shining as silver, almost as unchangeable as gold, malleable and ductile . . . strong as iron . . ." That was Aluminium—as the French felt about it in 1855; the year when aluminium first appeared at the Paris Exhibition; the year Napoleon III ordered a rattle of aluminium for his son.

Such wonderful exciting metal to the world of 1855. The possibilities? Enormous. The price? Prohibitive. Aluminium remained a precious metal until electrolytic extraction was patented in 1886.

Then, nearly a hundred years after the Prince Imperial's rattle was made, modern aluminium techniques were applied to the sheathing of power cables. Henley's today offer to the electrical industry the finest aluminium-sheathed cable obtainable.

- Easily installed — comparative rigidity
- Are considerably lighter than the equivalent lead-sheathed Cable
- Give superior mechanical protection
- Have smooth, clean and tidy appearance
- Permit fewer supports
- Resist vibration




## ALUMINIUM SHEATHED CABLES by HENLEY

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1

# Focus on Fry's

This picture of a jointing operation on a 0.25 sq. in. 11 kV cable, shows a typical application of Fry's ABBEY plumbers solder.

Quickly reaching its "buttery" consistency, the tin-rich composition of ABBEY solder guarantees rapid cooling, close graining and complete freedom from pinholes.

*Please write for full details of the* FRY'S *range of solder products.*

**FRY'S** *Metal Foundries Limited*

**Tandem Works, Merton Abbey, London, S.W.19. Tel: MITcham 4023**

*and at MANCHESTER · GLASGOW · BRISTOL & DUBLIN*

# CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

## TENDERS INVITED

### BOROUGH OF CHELTENHAM

TRUNK ROAD LIGHTING
BATH-LINCOLN TRUNK ROAD

TENDERS are invited for the supply and erection of a Group "A" Sodium discharge lighting installation as follows:

*Bill No.* 1. For the supply only of 123 No. 140 W non cut-off lanterns and lighting equipment.

*Bill No.* 2. For the supply and erection of 113 No. Steel Columns, together with fitting and wiring of tenderer's own lighting equipment.

*Bill No.* 3. As Bill No. 2 but for fitting and wiring of lighting equipment offered by another firm.

Specification and Bills of Quantities can be obtained from the undersigned on payment of a deposit of Three Guineas, which will be refunded on receipt of a bona fide tender, not subsequently withdrawn, and the return of all documents.

Drawings and Conditions of Contract can be inspected at this office during the usual working hours.

Tenders, together with fully priced Bills of Quantities are to be submitted in the envelope provided, to the Town Clerk, P.O. Box No. 12, Municipal Offices, Cheltenham, not later than first post, Monday 5 Sept., 1955.

The Council reserves the right to treat each Bill of Quantities as a separate tender, and does not bind itself to accept the lowest or any tender.

G. GOULD MARSLAND,
M.B.E., B.SC., M.I.C.E.
P.O. Box 12, Borough Engineer,
Municipal Offices, Cheltenham. (T 681)

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TENDERS invited for dismantling of electric overhead supply comprising: 2,500 lineal yards overhead line consisting of 4 wires ¼ in. diameter strand aluminium.

35—35 ft poles.

One oil circuit-breaker.

One 200 kVA Transformer 3,300/440 V.

Dismantling of overhead lines and poles to be completed by 20 Sept. Write Man-Abell Quarries Ltd., Mancetter, Atherstone, Wars. (T 739)

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### COUNTY BOROUGH OF DERBY

CLASS "A" STREET LIGHTING ON A.5111 TRUNK ROAD

TENDERS are invited for the supply of 65-140 W sodium discharge lighting units.

Tender documents may be obtained from the Borough Engineer and Surveyor, Council House, Corporation St, Derby.

Tenders, with completed Bill of Quantities, to be returned in a plain sealed envelope, endorsed "A.5111 Street Lighting," to the undersigned not later than first post on Monday, 29 Aug., 1955.

G. H. EMLYN JONES,
Town Clerk.
Council House,
Corporation St, Derby. (T 756)

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### ELECTRICITY (ESSENTIAL SUPPLIES) ACT (N.I.) 1954

CITY AND COUNTY BOROUGH OF BELFAST
ELECTRICITY DEPARTMENT

TENDERS are invited for the Supply, Delivery and Erection at the First Extension, Belfast Municipal Electric Power Station West of:

One 10 ton Overhead Travelling Crane and Two Electric Hoist Blocks of 5 ton and 5 cwt capacity respectively for use in the Station Workshop and Stores.

Form of Tender (N.1712), Conditions, Specification and Drawings, in quintuplicate, may be obtained from Messrs Merz and McLellan, Consulting Engineers, Carliol House, Newcastle upon Tyne 1, on payment of a deposit of Five Guineas which will be refunded provided a bona fide tender is lodged and not withdrawn. Extra copies of the tender document may be obtained at One Guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in quadruplicate, in sealed envelope marked "Tender for Overhead Travelling Crane, Electricity Department" and endorsed with the name and address of the tenderer, must be addressed to the Town Clerk, City Hall, Belfast, so as to reach him not later than 4 p.m. on Thursday, 22 Sept., 1955.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

C. A. R. SHILLINGTON,
Chairman,
Chichester House, Northern Ireland Joint
Chichester St, Electricity Committee,
Belfast.
3 Aug., 1955. (T 783)

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### CROWN AGENTS

EQUIPMENT FOR 22/6·6 kV SWITCHING STATION FOR MAURITIUS CENTRAL ELECTRICITY BOARD

TENDERS are invited for the supply of oil circuit-breakers; voltage transformers; air break switches; lightning arresters; neutral earthing resistance; and post insulators, all for 22 kV outdoor service, also 6·6 kV neutral earthing compensator; copper tube and tape; expansion joints; connectors and P.V.C. multicore control cable.

Forms of tender may be obtained on application in writing to the Crown Agents, 4 Millbank, London, S.W.1, quoting reference EM1/Mauritius C.E.B. 5. Tenders may be submitted for the whole or any part of the requirements. Applications from Agents must state the name of their Principal.

The Crown Agents do not bind themselves to accept the lowest or any tender, nor to assign any reason for the rejection of any tender nor to purchase the whole of the plant specified. (T 782)

**Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2**

## APPOINTMENTS VACANT

*Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.*

### MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

**Central Gloucestershire Sub-Area**

SECOND ASSISTANT DISTRICT ENGINEER
(DEAN FOREST)

Experience necessary in all branches of distribution work including construction, maintenance and operation of high and low voltage systems and substations, and the planning of system reinforcements and mains extensions. Technical qualifications desirable. Salary £715/£760 per annum (N.J.B. Grade E.7).

THIRD ASSISTANT DISTRICT ENGINEER
(DEAN FOREST)

Applicants should have had a sound technical training and experience in the construction, maintenance and operation of overhead and underground systems and substations. Technical qualifications desirable. Salary £635/£680 per annum (N.J.B. Grade E.9).

Apply in writing, within fourteen days, stating age, experience, present salary and position to Mr S. Raybould, Sub-Area Manager, Midlands Electricity Board, 126 London Rd, Gloucester.

Applicants who responded to the earlier advertisement of these posts under Class D will be considered along with new applicants.

**Wolverhampton and District Sub-Area**

GENERAL ASSISTANT DISTRICT ENGINEER
(LICHFIELD)

Applicants should have had a sound technical training and experience in the construction, operation and maintenance of overhead and underground distribution systems. Technical qualifications desirable. Salary £555/£600 per annum (N.J.B. Grade E.11).

Apply in writing, within fourteen days, stating age, experience, present salary and position to Mr D. Holt, Sub-Area Manager, Midlands Electricity Board, 83 Darlington St, Wolverhampton.

A. STEPHENS,
Secretary.
(T 785)

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### SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT COMMERCIAL ENGINEER
Central Sussex District

SALARY of £635 per annum rising to £680 per annum under N.J.B. Class E, Grade 9. Applicants must have had extensive experience in contracting and consumer service and be able to prepare specifications and estimates for domestic, commercial and industrial installations. A knowledge of farming applications would be an advantage.

Applications, naming 2 referees, to A. Barnes, M.I.E.E., Central Sussex District Manager, SEEBoard, Electra House, Church Rd, Haywards Heath, by 24 August, 1955.

DEMONSTRATOR (FEMALE)
Crawley District

Salary £525 x £20—£585 per annum under N.J.C. Grade 2. The successful applicant will be required to take an active part in the domestic electrical development of the New Town and her duties will include the interviewing of new residents, the selling of apparatus, the supervision of demonstrators and responsibility for demonstrations.

Applications, naming 2 referees, on forms from F. A. Avery, A.M.I.E.E., District Manager, SEEBoard, 55 High St, Crawley, by 24 Aug., 1955.

A. L. BURNELL,
Secretary.
(T 769)

## LONDON ELECTRICITY BOARD

SENIOR AND ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for the following vacancies. These posts are permanent and superannuable and they are graded under Schedule D of the National Joint Board agreement.

ENGINEERING DRAUGHTSMEN

Commencing salaries dependent upon qualifications and experience within Grade 6, £535, 10s./£661, 10s. per annum, inclusive of London Allowance.

**North Eastern Sub-Area**

(BASED AT STRATFORD, E.15)

Vacancy No. V/2012/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: engineering drawing; plant layout in substations; layouts and site plans of mains work; electrical diagrams.

**St. Marylebone/St. Pancras District**

(DESIGN AND PLANNING)

Vacancy No. V/1967/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV.

**Western Sub-Area**

(AT ECCLESTON PLACE, S.W.1)

Vacancy No. V/1947/T

Candidates must have had a good general and technical education up to National Certificate standard, and must be neat draughtsmen. They should be conversant with the layout of switchgear and transformers and associated equipment up to 11 kV for small substations. They should also be conversant with electrical diagrams, mains records, and similar work. Those with good experience in surveying and planning of mains networks would be considered even if having little experience of substation layouts.

**Southern Sub-Area**

(BASED AT BECKENHAM, KENT)

Vacancy No. V/1980/T

Candidates should have had a good general and technical education up to Ordinary National Certificate standard, be neat and capable draughtsmen and experienced in one or more of the following subjects: drawing office routine, electrical diagrams, layout of plant in transformer chambers, mains survey and recording of mains work.

**Chief Engineer's Department**

(AT STAMFORD ST., S.E.1)

Vacancy No. V/1989/T

Candidates should be experienced in surveying E.H.V. cable routes and have had good experience in making accurate surveys of cable routes during the laying of E.H.V. cables, taking information and sketches on site and producing final drawings.

**Chief Engineer's Department**

(AT STAMFORD ST., S.E.1)

Vacancy No. V/1989/T

Applicants, required for plant layout, should preferably have served an engineering apprenticeship and have had technical training to Ordinary National Certificate level, together with experience in the layout of transforming plant, H.V. switchgear and cables up to 66 kV. (In this instance an appointment may be made within Grade 5, £672/£777 per annum inclusive.)

SENIOR DRAUGHTSMEN

Commencing salaries dependent upon qualifications and experience within Grade 5, £672/£777 per annum, inclusive of London Allowance.

**Contracting Section**

(AT STRATFORD PLACE, W.1)

Vacancy No. V/1986/T

Applicants should be capable of completing layouts of plant and associated cabling for large industrial installations.

**St. Marylebone St. Pancras District**

(AT AYBROOK ST, W.1.)

Vacancy No. V/2001/T

Applicants should have had a good general and technical education in electrical

continued in next column

continued from previous column

engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV. In addition, the applicant should be capable of supervising Engineering Draughtsmen and/or Junior Draughtsmen, if required.

Application forms for the foregoing vacancies are obtainable from the Personnel Officer, 46/7 New Broad St, London, E.C.2. Please enclose addressed envelope and quote reference No. of vacancy preferred.T 351)

## SAO PAULO LIGHT AND POWER COMPANY LIMITED

**Brazil**

invite applications from suitably qualified single men for the position of ASSISTANT SHIFT CHARGE ENGINEER in the Piratininga Power Station. The power station, which has recently been completed, is situated near Sao Paulo (pop. 2·5 millions, temperature climate, 2,200 ft above sea level). The plant comprises 2 x 80 MW, 1,800 r.p.m. steam turbo-alternator units, each supplied at 850 p.s.i., 900° F by one 850,000 lb/hr oil-fired boiler. Applicants should have sound technical knowledge based on complete engineering course and practical training, including two or three years' apprenticeship in a modern steam plant followed by at least one year's experience as assistant shift charge engineer, or the marine equivalent. Good salary, three years' agreement subject to renewal with first class passage both ways; four months' paid leave after three years' service. Written application should be made to Mr W. P. Kellett, Joint Manager, Canadian-Brazilian Services Ltd., 148 Leadenhall St, London, E.C.3. (T 733)

## THE EAST MIDLANDS ELECTRICITY BOARD

STAFF VACANCY

THIRD ASSISTANT DISTRICT ENGINEER

BOSTON DISTRICT

APPLICATIONS are invited for the position of Third Assistant District Engineer in the northern area of the Boston District.

Candidates should have experience of both underground and overhead networks with voltages up to and including 11 kV and be capable of carrying through distribution schemes from the initial planning stage to final commissioning.

The possession of the Higher National Certificate in Engineering or an equivalent qualification, would be an advantage.

Ability to drive a motor vehicle is essential and the successful applicant will be required to reside in, or near to Spilsby, and to undertake standby duties.

The salary and conditions of service will be in accordance with the National Joint Board Agreement Class E, Grade 9, commencing at £635 per annum.

Applications giving details of age, education, qualifications, experience and position held, should be forwarded to the Manager of the Boston District, Besco House, Market Place, Boston, and be received within 14 days of this advertisement. (T 741)

## NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

**Aberdeen Area**

SENIOR ASSISTANT ENGINEER

APPLICATIONS are invited for the above position from qualified and suitably experienced engineers, and should be addressed to the undersigned before 31 Aug.

Applicants must be capable of engineering construction works in urban and rural developments, and at voltages up to 33 kV. Experience of 132 kV transmission-line maintenance would be an advantage.

The Area is about 1,100 square miles in extent, and includes high load density urban development as well as extensive rural networks. Load development is at rapid rate, and there are good prospects of early reclassification. Salary N.J.B. Class F, Grade 3/2, according to qualifications and experience, i.e. within the range of £975/£1,125 or £1,035/£1,200 on reclassification. Superannuation Scheme applicable.

J. E. WHITTAKER,
Area Manager.

Area Offices,
Millburn St. Aberdeen.
2 Aug., 1955. (T 751)

## YORKSHIRE ELECTRICITY BOARD

**No. 5 (Wakefield) Sub-Area**

Castleford District
Barnsley District

THIRD ASSISTANT DISTRICT ENGINEERS

APPLICANTS must have had a sound practical training and experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants should hold a current driving licence, be prepared to reside in the district and undertake standby duties.

Preference will be given to those who are Corporate Members of the Institution of Electrical Engineers or who hold equivalent qualifications.

Salary—N.J.B. Class F, Grade 9, £675/£15/£720 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 25 Aug., 1955.

**No. 3 (Sheffield) Sub-Area**

GENERAL ASSISTANT ENGINEERS (METERS, TESTING AND PROTECTION)

Applicants should have technical qualifications up to Higher National Certificate Standard and a general training in electrical engineering.

They will be required to carry out work on the installation, testing and commissioning of industrial metering and protective schemes.

Salary—N.J.B. Class M, Grade 16, £635/£15/£680 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 25 Aug., 1955. (T 750)

## ELECTRICITY AUTHORITY OF CYPRUS

**Electrical Engineers**

THE Electricity Authority of Cyprus require ELECTRICAL ENGINEERS for two tours each of 2 years with prospect of permanency. Commencing salary in scale £1,200 rising to £1,500 a year according to qualifications and experience. Free furnished quarters and passages. Liberal leave on full salary. Candidates, between 28 and 40, must have had sound training in both electrical and mechanical engineering with experience in the practical and administrative operation of electricity supply undertakings. They should possess competent knowledge of the operation and maintenance of 33 kV or 66 kV systems and the erection and maintenance of high and low voltage overhead and underground A.C. transmission systems, networks and substation plant. Preference will be given to Corporate Members of the Institution of Electrical Engineers. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/40498/EE. (T 768)

## SOUTH OF SCOTLAND ELECTRICITY BOARD

**Southern Area**

SECOND ASSISTANT DISTRICT ENGINEER (Berwick District). N.J.B. Grade D7, £675 x £15—£720.

THIRD ASSISTANT DISTRICT ENGINEERS (Two) (Berwick District). N.J.B. Grade D9, £595 x £15—£640.

Applicants should have a sound technical training and experience in operation and maintenance of overhead and underground distribution systems. Technical qualifications desirable. The engineers appointed will be required to reside in or near Berwick-upon-Tweed. A house will be available for at least one of the successful candidates. Applications stating age, qualifications and experience should reach the undersigned by 23 Aug.

G. H. SANKEY,
Area Manager.

P.O. Box No. 2,
High St, Galashiels. (T 770)

## THE NORTH WESTERN ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEERS

(*a*) SUB-AREA MAINS ENGINEER'S DEPARTMENT, MANCHESTER

(*b*) MAINS OPERATION SECTION, SUB-AREA MAINS ENGINEER'S DEPARTMENT, MANCHESTER

APPLICANTS should possess the H.N.C. in Electrical Engineering or an equivalent qualification and should have had a basic works training of not less than two years. Consideration will also be given to applicants in possession of the O.N.C. who are progressing towards obtaining their H.N.C.

Post (*a*). The successful candidate will be required to work in Manchester and surrounding districts, and will be given the opportunity to gain experience in various sections of the Mains Engineer's Department.

Post (*b*). The duties will be on a shift basis and successful candidates will be required to assist with the carrying out of switching duties on a large E.H.V. and L.V. transmission and distribution system including supervisory control.

Salary Scale: £475 x £15—£520 per annum. Grade M.20. N.J.B. Conditions.

Applications to Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by 20 Aug., 1955.

THIRD ASSISTANT ENGINEER (TESTING), HILL TOP TESTING STATION, WALKDEN

Applicants should have had wide experience of testing work, including testing of meters in a Class "A" Testing Station, polyphase and summation metering equipment, and protective gear in the laboratory and on site.

Preference given to applicants who are Graduate or Corporate Members of the Institution of Electrical Engineers.

Salary Scale: £840 x £20—£900 per annum. Grade L.10. N.J.B. Conditions.

Applications to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, 2 St. George's Rd, Bolton, by 20 Aug., 1955.

GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEER, KENDAL DISTRICT

The successful applicant will be required to assist in the preparation of estimates and the supervision of Contract work for Commercial, Industrial and Street Lighting Schemes. Experience in agricultural applications of electricity would be an advantage. Preference given to applicants who hold the H.N.C. in Electrical Engineering.

Salary Scale: £475 x £15—£520 per annum. Grade E.13. N.J.B. Conditions.

Applications to Sub-Area Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, by 20 Aug., 1955.

THIRD ASSISTANT DISTRICT ENGINEER NEW MILLS

Applicants should have had experience in operation and maintenance of underground and overhead networks, estimating of schemes, supervising installation of short services, preliminary surveying and assisting in routing overhead lines and preparing profiles. Preference given to applicants who hold H.N.C. in Electrical Engineering or equivalent qualifications.

Salary Scale: £635 x £15—£680 per annum. Grade E.9. N.J.B. Conditions.

Application forms can be obtained from the Sub-Area Manager, No. 7 Sub-Area, The North Western Electricity Board, Chapel St, Hazel Grove, Cheshire, and must be returned to him by 20 Aug., 1955.

(T 745)

## SOUTH WALES ELECTRICITY BOARD

require ASSISTANT ENGINEER in District 105/106, Carmarthen, Western Sub-Area.

Salary—Class D, Grade 7 (£675/£720) of the N.J.B. Schedule.

Applications stating age,, present position, salary, qualifications, experience and three referees, to be addressed to the Secretary (Establishments Section) to arrive by 20 Aug., 1955.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff.

(T 779)

## CENTRAL ELECTRICITY AUTHORITY
### Southern Division

APPLICATIONS are invited for the following posts:

ASSISTANT SHIFT CHARGE ENGINEERS MARCHWOOD GENERATING STATION

S/13.707

Applicants should have had previous experience in a large modern generating station, preferably one with high operating temperatures and pressures, and pulverised fuel or oil-fuel equipment. Preference will be given to those possessing qualifications leading to corporate membership of a recognised engineering institution, or those holding equivalent qualifications.

Salary N.J.B. Grade K.9, £840/£900.

ASSISTANT ENGINEERS (GRADE 10) MARCHWOOD GENERATING STATION

S/13.706

Those appointed may be required to perform the duties of a station shift control engineer, to assist on maintenance work, or to perform general station duties. Previous experience of modern generating station plant is essential.

Applicants should have had a sound technical training and should possess qualifications leading to corporate membership of an appropriate professional institution, or hold equivalent qualifications.

Salary N.J.B. Grade K.10, £790/£850.

GRADE 9 ENGINEER SOUTHAMPTON GENERATING STATION

S/13.702

Applicants should have had previous experience in a modern generating station, and manufacturing works experience will be an advantage. Preference will be given to those who either possess qualifications and experience leading to corporate membership of a recognised professional institution, or who are studying for the examination of such an institution.

The successful candidate may be required to undertake duties in either the boiler house or the turbine room.

Salary N.J.B. Grade F.9, £675 x £15—£720.

PROGRESS ENGINEER POOLE EXTENSION SITE GENERATION CONSTRUCTION DEPARTMENT

S/13.659

The work will consist of checking and recording the progress of plant erection and the forwarding of contractors' materials to site. Applicants should preferably have had a general engineering shop and drawing office training, and should be studying for a recognised technical qualification (mechanical and/or electrical). Site or shipyard experience covering the erection of boilers and turbines, pumps and switchgear, etc., will be an advantage.

Salary N.J.B. AX/CX Grade 6, £600/£765.

FOURTH ASSISTANT ENGINEER SWINDON REGION TECHNICAL DEPARTMENT

S/13.704

Applicants should have experience of electrical engineering in relation to protective gear including testing, and knowledge of modern switchgear practice is desirable. Applicants should possess H.N.C. or equivalent, and preference will be given to those who hold or are studying for membership of a recognised professional institution.

Salary N.J.B. Class AX/CX Grade 6, £600/£765.

DRAUGHTSMAN POOLE GENERATING STATION

S/13.676

Applicants should be experienced in the preparation and issue of diagrams, drawings and charts, and also in the maintenance of drawings filing systems.

Salary N.J.C. Grade 2, £525/£585.

Special application forms for each post obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 24 Aug. Please quote ref. E.T.

SHIFT OPERATION FOREMEN MARCHWOOD GENERATING STATION SOUTHAMPTON

Applicants should have knowledge and experience of the operation of modern high

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pressure pulverised fuel and/or oil-fired boilers, high pressure steam turbo-alternator sets, and all associated auxiliary plant. Experience of control of labour will be an advantage.

Salary N.J.I.C. Grade 1, Schedule E, £645 plus £70 shift allowance.

Applications, giving details of education, training and subsequent experience, with dates, should reach the Station Superintendent, Marchwood Generating Station, Marchwood, near Southampton by 24 Aug.

(T 786)

## UGANDA ELECTRICITY BOARD

APPLICATIONS are invited for permanent posts overseas as ASSISTANT ELECTRICAL ENGINEERS to meet the growth of the Board's system.

Experience in construction, operation and maintenance (preferably all three departments) of a public electricity supply system, including overhead lines and substations up to at least 33 kV, is essential; experience at higher voltages is desirable.

Applicants for all appointments should either be Corporate Members of the Institution of Electrical Engineers or should have technical qualifications leading to that status. Posts are vacant for those with considerable experience and for those with less, in the latter case, Graduate and Student Members would be eligible.

Salaries according to age and experience will be within the following annual incremental scales:

Corporate Members—£1,020 x £30—£1,260 with proficiency bar and thereafter x £30—£1,380 per annum, otherwise £990 x £30—£1,110 with proficiency bar and thereafter x £30—£1,260 per annum.

Uganda has a pleasant climate, income tax is moderate and the salaries which have recently been revised are very reasonable in relation to the cost of living.

Free passages, partly furnished accommodation, medical and dental treatment. Vacation leave on full pay after three years' service.

Application forms and further information may be obtained from the London Representative, Uganda Electricity Board, 27 Regent St, London, S.W.1.

C. R. WESTLAKE,
Chairman.

(T 638)

## AUSTRALIA—UNIVERSITY OF ADELAIDE

APPLICATIONS are invited for appointment as READER or SENIOR LECTURER IN ELECTRONICS in the Department of Electrical Engineering.

The University seeks a candidate well-grounded in Applied Mathematics and Physics who has had at least three years' recent experience in TV circuitry and C.R.O. techniques or allied work. The appointment will be made at Readership or Senior Lectureship level according to the qualifications and experience of the successful candidate.

*Terms:* Potential applicants are invited to seek from the undersigned* or from the Secretary of the Association of Universities of the British Commonwealth, 36 Gordon Square, London, W.C.1, a copy of the detailed conditions of appointment.

*Salary Scales:*

Reader: £A1,800—£A50—£A2,000
Senior Lecturer: £A1,500—£A50—£A1,750

*Superannuation:* On F.S.S.U. Basis.

*Application:* An application must include particulars of age, nationality, marital status, academic record, teaching qualifications, war service (if any) and present position; a list of publications; copies of testimonials; the names and addresses of two referees of whom enquiries may be made; a recent photograph; and a medical certificate of good health. It should be lodged in duplicate with the undersigned* not later than 15 Sept., 1955.

Further information about the post or about the University will gladly be supplied on request to

*V. A. EDGELOE, Registrar,
University of Adelaide,
Adelaide, South Australia.

(T 760)

## MECHANICAL AND ELECTRICAL ENGINEERS IN VARIOUS GOVERNMENT DEPARTMENTS

THE Civil Service Commissioners invite applications for pensionable posts in a wide variety of mechanical and electrical engineering duties.

Candidates must be under 35 on 1 Jan., 1956, with extension for regular service in H.M. Forces and up to two years for permanent civil service. For the Post Office they must be at least 21, for the Ministry of Supply, and Ministry of Transport and Civil Aviation (Civil Aviation Organisation) at least 23; for other posts at least 25 on that date.

Generally a candidate must possess a University degree in Engineering or be a Corporate Member of one of the professional institutions—Mechanical Engineers, Electrical Engineers, or Civil Engineers or have passes in, or exemption from, Sections A or I and B or II of the corresponding Associate Membership examinations. Exceptionally candidates of high professional attainment, but without the specified qualifications, may be admitted. For some posts Associate Fellowship of the Royal Aeronautical Society or an Honours degree in Physics or Engineering will be accepted.

London salary (men) £675 (at age 25) to £1,035. Starting salary according to age up to £930 at 34. Candidates entering below age 25 will start at salaries varying from £472 at age 21 to £595 at age 24. Prospects of promotion. Salaries of next higher grades are £1,035/£1,355 and £1,410/£1,575. Somewhat lower in the provinces. Women's scales lower but being improved under equal pay scheme.

Further particulars and application forms from Civil Service Commission, Scientific Branch, 30 Old Burlington St, London, W.1, quoting No. S85/55. Completed applications should be returned as soon as possible and in any case before 31 Dec., 1955. (T 746)

## CENTRAL ELECTRICITY AUTHORITY
### South Eastern Division

1. ASSISTANT ENGINEER (Operation and Efficiency)—Brighton "A" and "B" Power Stations. Applicants should preferably possess an Engineering Degree or be Corporate Members of either the Institution of Mechanical or Electrical Engineers. The successful applicant will be responsible to the Station Superintendent for the efficient operation, technical investigations and plant testing of the Power Station plant. Class L, Grade 5, £1,195/£1,300 per annum.

2. FOURTH ASSISTANT ENGINEERS (Communications) at the South Thames Control Centre, East Grinstead. Applicants who should possess H.N.C. or equivalent should have had sound training in telecommunications or electronics with the G.P.O. or a leading manufacturer. Successful applicants will be expected to live in the vicinity of the Control Centre. Salary according to experience or qualifications in accordance with either Grade 6, £600/£725/£785 per annum, or Grade 5, £675/£800/£860 per annum.

Detailed written applications should be sent according to location of vacancy to Station Superintendent, Brighton Power Station, Portslade-by-Sea, Sussex, or Establishments Officer, Central Electricity House, Lower Ham Rd, Kingston-on-Thames, to arrive by 20 Aug. (T 784)

## COUNTY BOROUGH OF WEST HAM EDUCATION COMMITTEE
### West Ham College of Technology
ROMFORD ROAD, STRATFORD, E.15

REQUIRED: ELECTRICIAN for electrical maintenance of College and Laboratory Equipment in Electrical Engineering Department.

Wages in accordance with current rate of Electrical Contracting Industry. Weekly hours of duty: 44.

Application forms, obtainable from the undersigned, should be returned not later than 27 Aug., 1955.

R. OPENSHAW,
Chief Education Officer.

95 The Grove, Stratford, E.15. (T 772)

## SOUTH WESTERN ELECTRICITY BOARD
DISTRICT ENGINEER (DESIGNATE)
MINEHEAD

SALARY N.J.B. Class C, Grade 3, £790/£850 per annum.

This post is being advertised well in advance of the retirement of the present occupant.

The successful candidate will be responsible to the District Manager for the planning, construction, operation and maintenance of the distribution system, including protective gear throughout the District, the preparation of schemes and estimates and the control of Capital and Revenue expenditure.

Candidates should possess extensive knowledge of, and have had wide experience of, the engineering side of the Industry and be capable of promoting a progressive Engineering Development Policy.

Corporate membership of the I.E.E. and the possession of a current driving licence are most desirable.

Application forms available from the District Manager, 7 Friday St, Minehead, are to be returned by 23 Aug., 1955.

THIRD ASSISTANT DISTRICT ENGINEER
(OPERATION AND MAINTENANCE)
BRIDGWATER

Salary N.J.B. Class E, Grade 9, £635/£680 per annum.

The successful candidate will be responsible for duties in connection with operation and maintenance of E.H.T. and L.V. mains and plant.

Applicants must have had sound practical experience in the operation and maintenance of 33 kV, 11 kV and L.V. underground and overhead networks, substation plant and ancillary equipment. Possession of a current driving licence is required.

The candidate appointed should be prepared to reside in the Bridgwater District and undertake standby duties.

Application forms available from the District Manager, Mount St, Bridgwater,, are to be returned by 23 Aug., 1955. (T 771)

## CENTRAL ELECTRICITY AUTHORITY
### South Western Division
TECHNICAL STAFF VACANCIES

(*a*) DEPUTY STATION SUPERINTENDENT, Newton Abbot Power Station, N.J.B. F.3, £975/£1,050.

(*b*) STATION SHIFT CONTROL ENGINEER, East Yelland Power Station, N.J.B. G.10, £675/£720.

Superannuation.

Applicants for (*a*) should have had a sound technical education and considerable practical experience in power station operation, maintenance and administration. Corporate Membership of a recognised Engineering Institution or equivalent desirable.

For (*b*) should possess good technical qualifications, and have had training and experience in the control and operation of steam generating plant and main switchgear.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 27 Aug., 1955. (T 753)

## MINISTRY OF TRANSPORT AND CIVIL AVIATION

require in London MECHANICAL and ELECTRICAL ENGINEERING DRAUGHTSMEN for work on aviation telecommunications projects. Applicants must have experience of (*a*) mechanical detailing of light current electrical engineering assemblies, (*b*) electronic circuit design or (*c*) telecommunications equipment rack assembly and layout. Preference given to candidates with working knowledge of I.D.P./13 Specification governing preparation of drawings. O.N.C. in Electrical Engineering, C. and G. Certificates in Telecommunications or Radio, or equivalent qualifications an advantage but not essential. Salary from £442, 10s. at 21 to £695 (men) and £626 (women). Women's pay being improved under equal pay scheme. Apply any Employment Exchange quoting Order No. Westminster 3753/AC. (T 747)

## CENTRAL ELECTRICITY AUTHORITY
### Eastern Division

APPLICATIONS are invited for the following appointment:

MAINTENANCE ENGINEER (ELECTRICAL)
NORWICH GENERATING STATION

Salary Class F, Grade 6, £790 x £20—£850 per annum.

Applicants should have served an apprenticeship and possess good experience in the maintenance of generating station electrical plant, including high voltage switchgear and instruments.

Previous generating station operating experience and appropriate technical qualifications will be an advantage.

Applications stating age, details of qualifications and experience should be sent to the Controller, Central Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, not later than 27 Aug., 1955.

W. N. C. CLINCH,
Controller. (T 754)

## ASSISTANT EXPERIMENTAL OFFICERS

required by THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY, Aldermaston, Berks, to assist in the design and use of electrical gauges (e.g. Strain gauges, capacitance or inductance gauges) used mainly for measuring small thermally and mechanically-induced strains. A knowledge of the design and operation of any instruments of these types would be advantageous. The minimum qualification is H.S.C. (Science) or equivalent.

Salary: £310 (age 18)—£685 per annum (male). The successful applicants will be required to join the Authority's contributory superannuation scheme.

Housing. Housing accommodation will be available on one of the Authority's estates within a reasonable period for married officers who now live outside the radius of the Establishment's transport facilities.

Alternatively the Authority may be able to assist successful applicants in the purchase of a house and until permanent accommodation is available a lodging allowance may be payable.

Requests for application forms by postcard to Senior Recruitment Officer, A.W.R.E., Aldermaston, Berks. Quote ref. A/628/49. (T 740)

## MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN required in the Board's No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Salary within the range £510/£630 per annum (N.J.B. Schedule D, Grade 6).

Applicants should be experienced in one or more of the following:

Building and Civil Engineering Design.
Engineering Drawing.
Structural Steelwork Design.
Overhead Line Design.

Possession of the Higher National Certificate would be an advantage.

The appointment is superannuable and subject to medical examination.

Standard application forms obtainable from the Manager, at the above address, or from any of the Board's District Offices. Closing date 22 Aug., 1955. (T 776)

## SOUTH WESTERN ELECTRICITY BOARD
### Taunton District
GENERAL ASSISTANT ENGINEER

SALARY N.J.B. Class E, Grade 11, £555/£600 per annum.

Duties include general assistance in construction and maintenance of overhead lines, underground mains and substations; operation of the system including H.V. switching operations; assistance in planning work for rural development and reinforcement schemes.

Possession of H.N.C. and experience in surveying would be an advantage.

Application forms obtainable from the District Manager, Electricity House, The Parade, Taunton, are to be returned by 23 Aug., 1955. (T 773)

**MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD**

**Staff Vacancy Notice**

ASSISTANT SUB-AREA ACCOUNTANT required in the Board's No. 2 Sub-Area office, at Eversley, Frodsham, Warrington, at a salary within range of £1,080 x £30—£1,200 per annum (N.J.C. Grade 9).

Candidates should possess an accounting qualification and have had wide practical experience. The duties of the post will include a degree of supervision of general work of the Sub-Area Accountant's department.

The appointment is superannuable and subject to medical examination. Detailed applications, addressed to the Manager, No. 2 Sub-Area, Merseyside and North Wales Electricity Board, Sandiway House, Nr. Northwich, Cheshire, should be received by him not later than Tuesday, 23 Aug., 1955. (T 780)

**SOUTH OF SCOTLAND ELECTRICITY BOARD**

**Dumfries and Galloway Area**

APPLICATIONS are invited for the appointment of a SECOND ASSISTANT ENGINEER (Construction) at Area Headquarters. Salary and conditions of employment will be in accordance with the National Joint Board Agreement, Class G, Grade 8, £755/£800 per annum.

Applicants should have experience in the planning and erection of substations and overhead and underground systems up to 33 kV in rural and urban areas.

The position is superannuable. Applications should be made on the standard application form, which may be obtained from the undersigned, and should be returned not later than 30 Aug., 1955.

W. H. WILLS,
Manager.

Marchmount,
Dumfries. (T 755)

**NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD**

THIRD ASSISTANT ENGINEER (TECHNICAL)

APPLICATIONS are invited for the above post at the Board's Head Office. Applicants should have a degree in Electrical Engineering, practical training and experience of technical work connected with the design and operation of transmission and distribution systems.

Salary commencing at a point within the range £875/£1,000 (N.J.B. Schedule C, Class AX, Grade 3) depending on experience and qualifications. Superannuation Scheme applicable. Application forms may be obtained from The Secretary, 16 Rothesay Terr, Edinburgh 3, and should be returned not later than 29 Aug., 1955. (T 774)

**CENTRAL ELECTRICITY AUTHORITY**

**North West Merseyside and N. Wales Division**

VACANCY No. E.197/265T.—STATION SHIFT CONTROL ENGINEER, Bromborough Generating Station, Ches. Salary £715/£760 (H.10).

Vacancy No. E.197/271T. — SHIFT CHARGE ENGINEER, Wallasey Generating Station, Ches. Salary £675/£720 (D.7).

Vacancy No. E.197/272T.—ASSISTANT SHIFT CHARGE ENGINEER, Warrington Generating Station. Salary £675/£720 (F.9).

Applications, quoting Vacancy No., to Divisional Secretary, Central Electricity House, 825 Wilmslow Rd, Manchester 20, before 20 Aug. (T 752)

**NORTH EASTERN ELECTRICITY BOARD**

**Harrogate Sub-Area**

THIRSK DISTRICT

APPLICATIONS are invited for the appointment of SECOND ASSISTANT DISTRICT ENGINEER, with location at Bedale.

Salary—Schedule A, Class D, Grade 7—£675/£720. N.J.B. conditions of service.

Applications stating age, qualifications and experience to be received by the Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. (T 767)

**MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD**

ASSISTANT SECTION ENGINEER to be based on Pwllheli, required in the Caernarvon District of the Board's No. 4 Sub-Area. Salary within the range £635/£680 per annum (N.J.B. E/9). Duties include the erection and maintenance of H.V. and M.V. overhead and underground systems.

The appointment is superannuable and subject to medical examination.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date 22 Aug., 1955. (T 775)

**CENTRAL ELECTRICITY AUTHORITY**

**South Wales Division**

Vacancy No. 83/55

APPLICATIONS invited for superannuable N.J.B. appointment of STATION SHIFT CONTROL ENGINEER at Lydney Power Station.

Salary: D.10, £555 x £15—£600 per annum.

H.N.C. and experience in power station control room desirable.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Authority, Twyn-y-Fedwen Rd, Gabalfa, Cardiff, to be returned by 24 Aug., 1955. (T 781)

**KENT EDUCATION COMMITTEE**

**Maidstone Technical College, Tonbridge Road, Maidstone**

LABORATORY TECHNICIAN required mainly for work in Electrical and Mechanical Engineering Laboratories.

City and Guilds or National Certificate qualifications preferred.

Salary on scale £420 rising to maximum of £485.

Apply at once to the Principal stating fully qualifications and experience, together with the names and addresses of two referees. (T 732)

**SOUTH WALES ELECTRICITY BOARD**

require DISTRICT COMMERCIAL MANAGER in District 348, Cardiff West, Central Sub-Area.

Salary—Class E, Grade 2 (£975/£1,050) of the N.J.B. Schedule.

Applications stating age,, present position, salary, qualifications, experience and three referees, to be addressed to the Secretary (Establishments Section) St. Mellons, to arrive by 20 Aug., 1955.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (T 778)

**SOUTH WALES ELECTRICITY BOARD**

require SENIOR ENGINEERING DRAUGHTSMAN in the West Central Sub-Area, Fforestfach.

Salary Grade 5 (£640/£740), Schedule D, of the N.J.B. Schedule.

Applications stating age, present position, salary, qualifications, experience and three referees, to be addressed to the Secretary (Establishments Section) to arrive by 20 Aug., 1955.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (T 777)

**CENTRAL ELECTRICITY AUTHORITY**

**East Midlands Division**

APPLICATIONS are invited for the following positions with the Division:

MAINTENANCE ENGINEER (ELECTRICAL), LONGFORD POWER STATION, COVENTRY
Vacancy No. 129/55/ET

Applicants should have received a thorough technical and practical training followed by considerable experience in testing protective gear, maintenance of alternators, transformers, switchgear and associated equipment and be capable of taking control of the electrical maintenance staff.

Preference will be given to candidates who are associated members of a recognised Institution or possess similar qualifications.

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Salary will be in accordance with Class G, Grade 6 (£840/£900 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 24 Aug., 1955.

MAINTENANCE ENGINEER (MECHANICAL), CASTLE DONINGTON POWER STATION
Vacancy No. 130/55/ET

Applications from suitably qualified engineers are invited for the above position; candidates should have good administrative and organising ability and have experience in all aspects of the maintenance of modern large capacity high pressure turbo-alternators and pulverised fired boilers.

Apprenticeship at a large manufacturing works will be an advantage.

Salary will be in accordance with Class L, Grade 6, of the National Joint Board Agreement (£1,110/£1,200 per annum).

Closing date for receipt of applications, 24 Aug., 1955.

OPERATION AND EFFICIENCY ENGINEER, CASTLE DONINGTON POWER STATION
Vacancy No. 131/55/ET

Candidates should have wide experience of the operation and maintenance of a large modern Generating Station with P.F. Boiler plant. The successful applicant will be responsible to the Station Superintendent for ensuring that all sections of the plant attain the specified efficiency and for the carrying out of special investigations and tests.

The possession of the Higher National Certificate or equivalent would be an advantage.

Salary will be in accordance with Class L, Grade 6, of the National Joint Board Agreement (£1,110/£1,200 per annum).

Closing date for receipt of applications, 24 Aug., 1955.

ASSISTANT ENGINEER (INSTRUMENTS), CASTLE DONINGTON POWER STATION
Vacancy No. 132/55/ET

Applicants should have had sound practical experience in the maintenance of instruments in a modern high pressure P.F. fired Power Station.

The possession of the Higher National Certificate or equivalent would be an advantage.

Salary will be in accordance with Class L, Grade 10, of the National Joint Board Agreement (£840/£900 per annum).

Closing date for receipt of applications, 24 Aug., 1955.

These appointments will be pensionable within the terms and provisions of the Central Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.
(T 766)

**LONDON ELECTRICITY BOARD**

DEMONSTRATOR (FEMALE)

APPLICATIONS are invited for the above position in the Hampstead/Willesden District.

Applicants should be suitably qualified, holding the E.A.W. or other approved certificate including electrical housecraft and have experience in conducting demonstrations. They should also be experienced in advising on the selection and use of domestic electrical appliances. The post is graded within the National Joint Council agreement (Administrative and Clerical Grades) as Grade 1, i.e. £425/£525 per annum, plus the appropriate London Area Allowance.

Application forms obtainable from Personnel Officer, 46/7 New Broad St, London, E.C.2, to be returned completed by 20 Aug., 1955. Please enclose addressed envelope and quote ref.: V/1941/T. (T 787)

**INTERESTING CAREER IN HIGH POWER ELECTRICAL TRANSFORMER WORK IS OFFERED BY THE ENGLISH ELECTRIC COMPANY STAFFORD and LIVERPOOL**

A special one year course will commence in September next for young men who have completed National Service and have a University Degree or Higher National Certificate or similar qualifications in electrical engineering.

The course is intended to produce young transformer engineers in the commercial and design fields.

Salaries from £425/£550 per annum will be paid during training, and permanent pensionable posts with attractive prospects are available at home and abroad at the end of the training period.

**Apply to Dept. C.P.S., 336/7 Strand, W.C.2,** quoting Ref.: 396M

(T 726p)

AGENTS with technical electrical knowledge required for North East coast area for Switchgear and Motor Control Gear. Must have established connection with industry in that area. Reply, giving full details, to Erskine, Heap and Co., Ltd., Lancashire Switchgear Works, Manchester 7. (T 743)

AN INSTALLATION MANAGER required by Dublin firm of Electrical Contractors. Applicants should be between 30 and 40 years of age, should have a thorough knowledge of electrical engineering and contracting, and be capable of dealing with installations from initial enquiry to completion stage. Salary from £850 per annum upwards, depending on experience. Apply—Box No. 4729, Electrical Times. (T 748)

APPLICATIONS are invited by a firm in the North-West for the position of a TRANSFORMER DESIGN ENGINEER. The work covers all types of distribution and medium power units. Applicants should hold a University Degree or H.N.C. in electrical engineering. A sound engineering training is essential for the position, which holds good prospects. Salary depending on experience, in the order of £1,000 to £1,100 per annum. Full particulars, age, etc.—Box No. 4695, Electrical Times. (T 598)

ASSISTANT ENGINEER required for Overhead Line Contracts, Inverness Area. Good salary plus subsistence if applicable. Apply: B. French Limited, Pike Mills, Green St, Kidderminster. (T 596)

ASSISTANT ENGINEER / SURVEYOR required in connection with overhead line work in East Scotland. Applicants should have experience in this type of work and preferably be under 40 years of age. Applications giving details of training, experience and age to Employment Manager, Messrs Johnson and Phillips Ltd., Victoria Works, Charlton, S.E.7. (T 694)

ASSISTANT WORKS MANAGER required for new factory at Crawley, Sussex, engaged on Transformer manufacture up to 100 kVA and light electrical control equipment. Essentially a good disciplinarian. House available if required. A progressive situation offering good scope for a keen person. Full details to—Box No. 4693, Electrical Times. (T 597)

CENTRAL ELECTRICITY AUTHORITY Bankside House, S.E.1, require a FOURTH ASSISTANT ENGINEER to assist in statistical analysis of power station operation results. Candidates should preferably have served a power station apprenticeship, and have obtained H.N.C. Mechanical Engineering. Experience in calculations of turbine and boiler test results would be an advantage. Candidates should possess an aptitude for mathematics and be prepared to study statistical methods of analysis. A genuine interest in extracting information from numerical data by detailed analysis is essential. Salary in N.J.B. Grade 4, £709/£893 per annum inclusive. Applications stating age, qualifications, experience, present position and salary to D. Moffat, Director of Establishments, Winsley St, W.1, by 26 Aug. Quote Ref. AE/651. (T 758)

CONSULTING Engineer requires ASSISTANT ELECTRICAL ENGINEERS and DRAUGHTSMEN with some experience of preparing drawings and specifications for internal services in buildings. Application in writing to Barlow, Leslie and Partners, 5 Catherine Place, London, S.W.1. (T 735)

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ELECTRICAL Contractors require an ESTIMATING AND SUPERVISING ENGINEER immediately. Only Engineers possessing thorough knowledge of the business should apply. Write stating experience, age and salary required. Apply Christy Bros. Limited, Chelmsford, Essex. (T 759)

ELECTRICAL ENGINEER/DRAUGHTSMEN required by Ashmore, Benson, Pease and Co., Stockton-on-Tees, for complete electrical installation, design, including motor application, control scheme engineering, distribution and cabling. Experience of contract work and estimating an advantage. Maximum assistance given in obtaining accommodation, one house and two flats already available. Pension Scheme, Technical Library and sports facilities available.

Apply stating age, experience, etc., quoting Ref. W, to Staff Personnel Officer. (T 761)

ELECTRIC Motor Rewinds, G. R. Marson Ltd., 110/116 Queen Victoria Rd, Coventry, require a number of experienced ENGINEERS for their motor rewind department. (T 764)

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INDUSTRIAL HEATING ENGINEERS—Vacancies exist on the staff of The General Electric Co., Ltd., at the Head Office of their Sales Organisation in Kingsway. Applicants, not over 35 years of age, should have had previous sales experience and be familiar with the preparation of I.H. schemes. Apply in writing, quoting ref. I.H., to the Staff Manager, Magnet House, Kingsway, W.C.2. (T 645)

IMPERIAL CHEMICAL INDUSTRIES LTD., Lime Division, Buxton, Derbyshire, has a vacancy for an ELECTRICAL ENGINEER. Candidates should possess a degree in Electrical Engineering and have had some industrial experience on heavy electrical plant and equipment operating at voltages up to 11,000. A knowledge of automatic control equipment as applied to plants and processes is desirable. The division operates large mechanised limestone quarries with electrically-operated excavating and drilling equipment, crushing plants, vertical and rotary kilns, lime and limestone processing plants, etc. The main works are situated near Buxton in the Peak District of Derbyshire. Excellent conditions of employment are available, including Staff Pension Fund. After joining the staff married men will receive a reasonable refund of removal (including travel) expenses, and to assist them in house purchase, facilities could be made available in approved cases for loans. Write, giving details of age, qualifications and experience to Division Staff Officer, at the above address. (T 765)

LEADING OIL COMPANY has vacancy in Iraq for ELECTRICAL ENGINEER. Duties comprise the preparation of designs and specifications in connection with electrical layout of small transformer substations, underground and overhead medium voltage networks, industrial flameproof power and lighting installations for Pumphouses, Workshops, Oil Depots, Tank Farms, Offices and Domestic Premises, etc. and supervision of erection of foregoing. Applicants, aged 33-40, should possess engineering degree and at least Graduate Membership of I.E.E. and must have had Drawing Office and practical experience and preferably have served indentured apprenticeship. Attractive salary plus generous allowance in local currency, free passages out and home, free medical attention, good leave arrangements. Pension Scheme. Kit Allowance. Write giving full particulars of qualifications and experience, quoting F.505, to Box 1470, c/o 191 Gresham House, E.C.2. (T 757)

MAINTENANCE ELECTRICAL ENGINEER (Distribution) required for service with Sudan Light and Power Co., Ltd., in Khartoum, Sudan. Basic salary on appointment within the range £E.900/£E.1,380 per annum according to age, qualifications and experience (£E.1=£1. 0s. 6d.).

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Responsibilities attached to the appointment include the maintenance and repair of an extensive electricity distribution system, i.e. H.T. and L.T., O.H. and U.G. Mains, Substations, Traction Supplies, D.C. through Rectifier Equipment, and associated protective relay equipment. Experience on 33 kV transmission work and knowledge of A.C. motors and starting equipment up to 300 H.P. would be of considerable advantage. The candidate chosen will be required to undertake the training of Sudanese as part of his duties.

Appointment will be on contract, by arrangement up to five years, including a period of twelve months' probation, with a bonus payable on completion of the contractual period. Free living accommodation with basic furniture will be provided or an allowance in lieu thereof. After satisfactory completion of the probationary period liberal leave on full salary with free passages will be granted. A cost of living allowance will be payable in addition to basic salary and a kit allowance of £E.50 will be paid on appointment.

Applications stating age, education, qualifications, experience (with particulars of posts held), present appointment and salary with names of two references should be submitted to The Secretary, The Power and Traction Finance Company Limited, Queens House, Kingsway, London, W.C.2. (T 731)

OVERHEAD LINE ENGINEERS, fully experienced in the design of 11 kV and 33 kV lines, with practical field experience, required for Scottish office of electrical engineers. Good salary and prospects, superannuation, removal expenses, if necessary. Apply giving full particulars, age, married or single, and salary required, all in strict confidence to—Box No. 4717, Electrical Times. (T 679)

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TECHNICAL DESIGNER and DESIGNER DRAUGHTSMAN required with knowledge of production of light to medium electro and mechanical products. Please reply stating full particulars, experience, age and salary required, to S.E.I. Ltd., Times Mill, Heywood, Lancs. (T 724)

THE JERSEY ELECTRICITY CO., LTD., requires a versatile engineer as TECHNICAL ASSISTANT to the Managing Director. Applicants should possess recognised engineering qualifications and should have experience in the electricity supply industry. Some knowledge of radio and television would be an advantage. Commencing salary £900 per annum. Applications to: The Managing Director, Jersey Electricity Co., Ltd., 11 Broad St, Jersey, C.I., endorsed "technical assistant." (T 736)

UNILEVER LTD. require a TECHNICAL ASSISTANT (Electrical) for their Central London Office for the design and layout of factory electrification schemes including substations, H.T. Ring Mains, Transformers, M.T. Switchboards, Cabling Distribution Boards, Motors, Starters and Lighting. Electrical contracting experience would be an advantage. Applicants must be between 25 and 30 years of age and must hold the Higher National Certificate in Electrical Engineering. Preference will be given to a man holding the Graduate Examination of the I.E.E. Five-day week. Superannuation Scheme. Salary according to experience. Successful applicant would have to be passed by the Company's Medical Officer. All applications will be treated in the strictest confidence and should be addressed to: Personnel Division (WAD 92), Unilever Ltd., Unilever House, Blackfriars, E.C.4. (T 749)

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TELEPHONE ENGINEER, aged 31, seeks overseas post. Fully qualified maintenance and installation, manual/auto, 15 years' experience, City and Guilds Final Cert.—Box No. 4705, Electrical Times. (T 618)

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## PATENTS

THE proprietor of British Patent No. 614373, entitled IMPROVEMENTS IN ELECTRIC DRY BATTERIES, offers same for licence or otherwise to ensure its practical working in Great Britain. Inquiries to Singer, Stern and Carlberg, Chrysler Bldg, New York 17, N.Y., U.S.A. (T 738)

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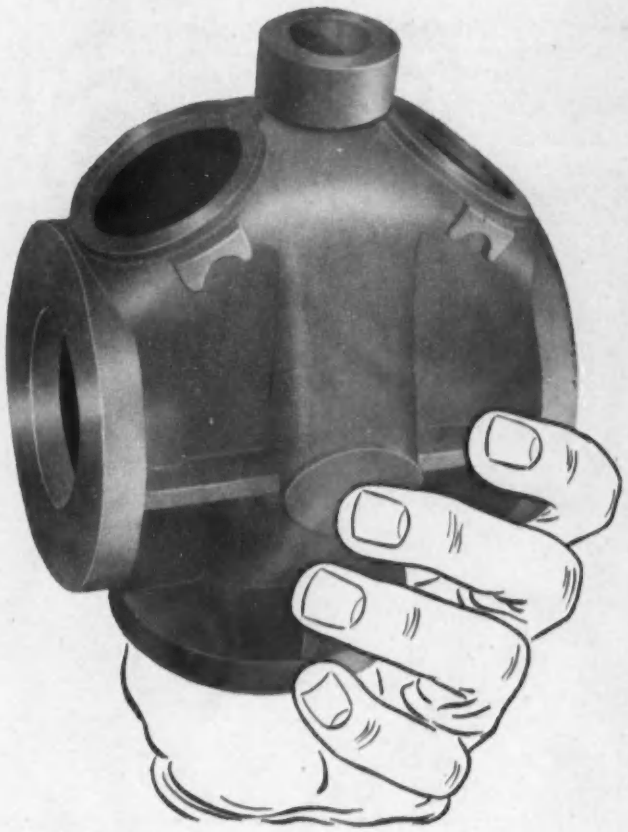

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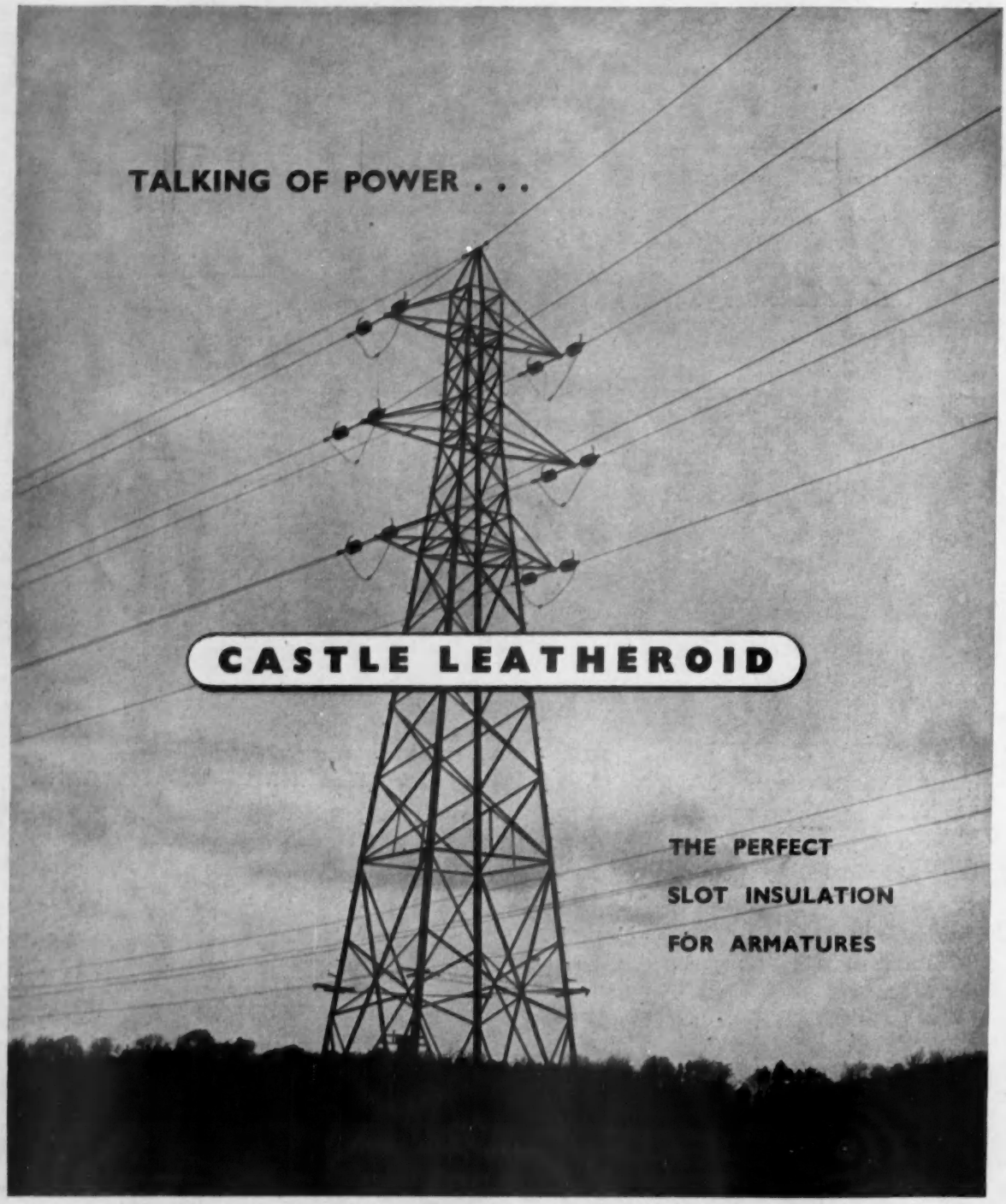


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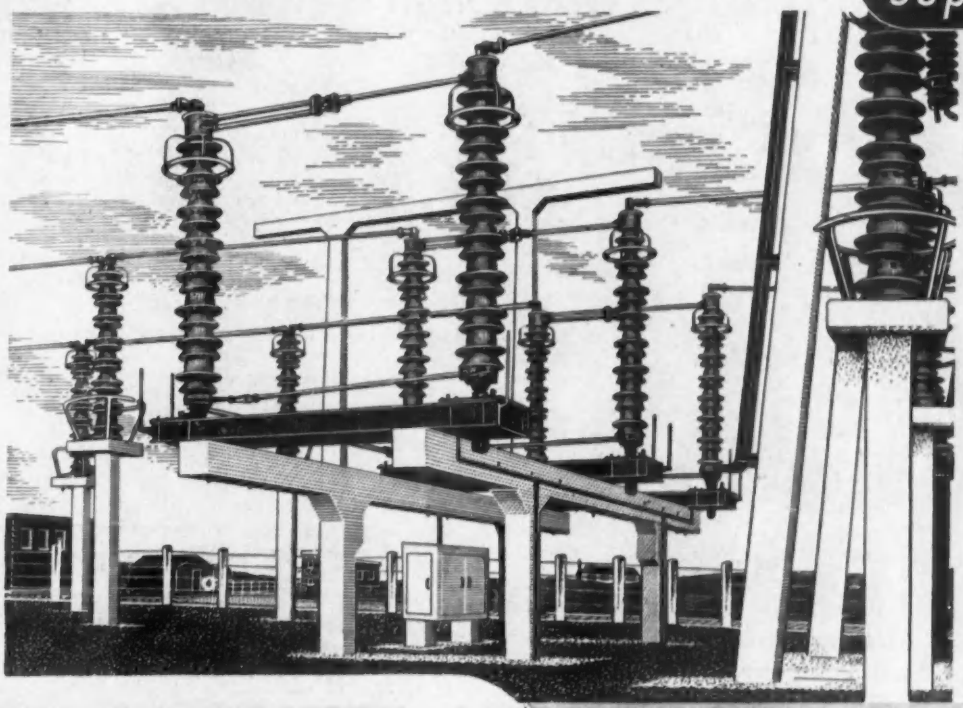

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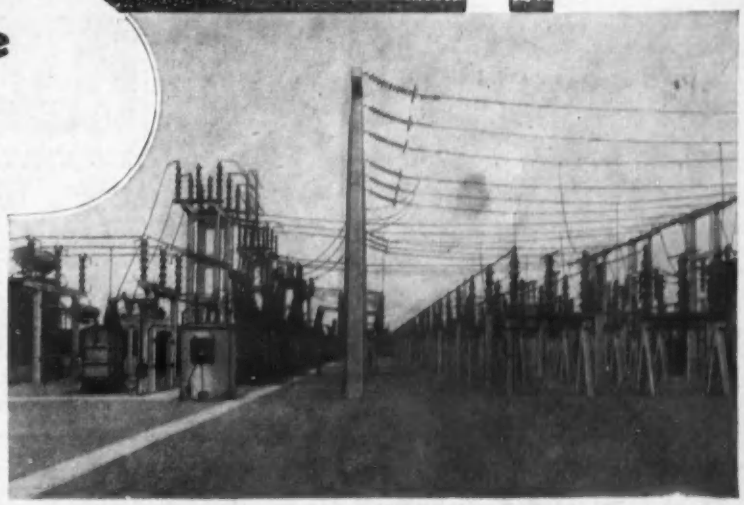

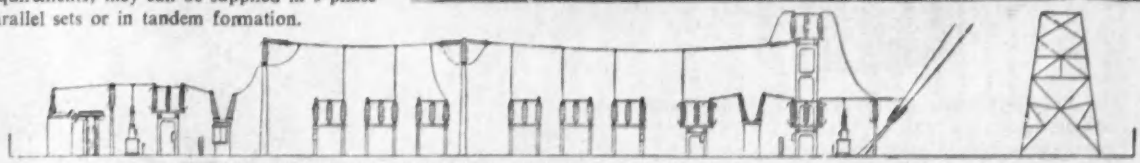

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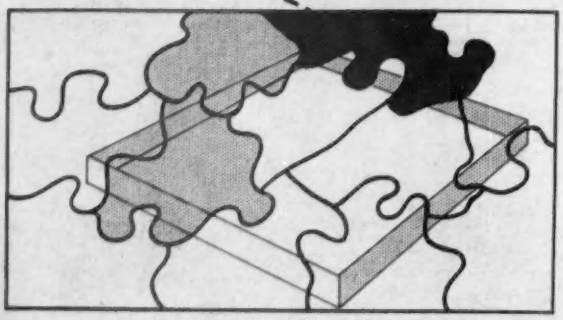

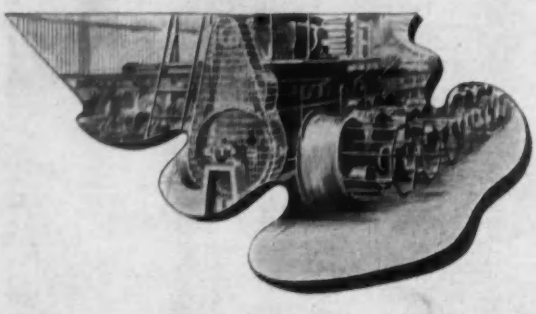

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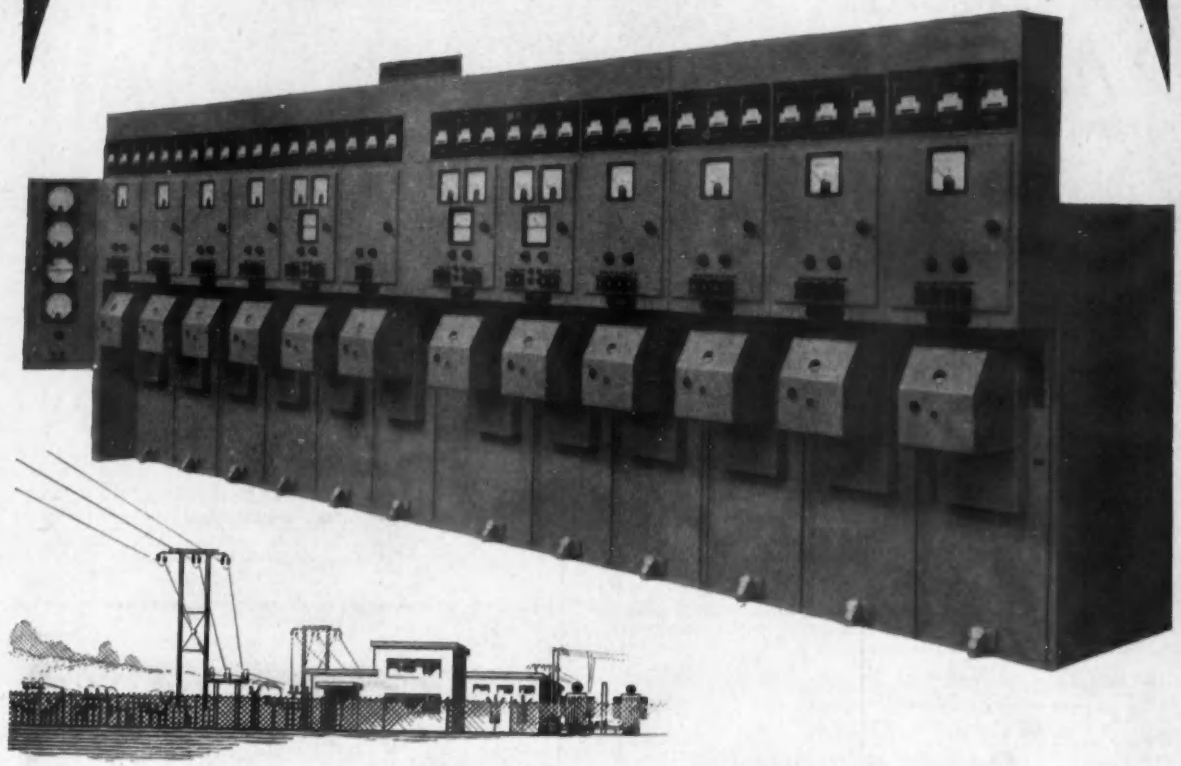

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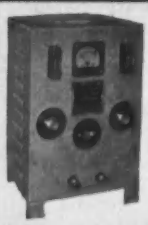

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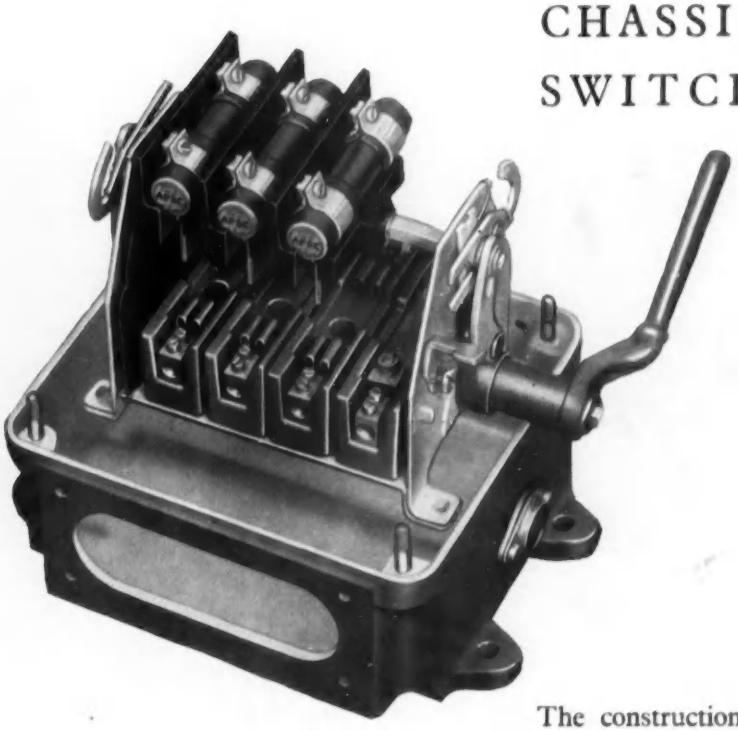
## CHASSIS-TYPE SWITCHGEAR



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